Site C Clean Energy Project

Fisheries and Aquatic Habitat Monitoring and Follow-up Program

Peace River and Site C Reservoir Water and Sediment Quality Monitoring Programs (Mon-8 and Mon-9)

Construction Year 5 (2019)

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January 17, 2020

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Peace River and Site C Reservoir
2019 Water and Sediment Quality Monitoring Programs

PRESENTED TO

British Columbia Hydro and Power Authority

JANUARY 17, 2020
ISSUED FOR USE
FILE: 704-ENW.VENW03060-03

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EXECUTIVE SUMMARY

As part of the Water and Sediment Quality Monitoring Programs, the Saulteau EBA Environmental Services Joint Venture (SEES JV) conducted the water and sediment quality sampling program associated with the Site C Clean Energy Project (the Project) on behalf of the BC Hydro and Power Authority (BC Hydro). The Project is located along the Peace River near the City of Fort St. John between the Districts of Hudson's Hope and Taylor, BC.

In accordance with the Provincial Environmental Assessment Certificate Condition No. 7 for the Project, BC Hydro has developed the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP). The FAHMFP includes two monitoring programs focused on assessing the effects of the Project on water and sediment quality:

- Site C Mon-8 – Site C Reservoir Water and Sediment Quality Monitoring Program. This program will investigate the effects of reservoir formation on water and sediment quality; and
- Site C Mon-9 – Peace River Water and Sediment Quality Monitoring Program. This program will investigate the effects of the Project on water and sediment quality in the Peace River downstream of the Project.

Mon-8 and Mon-9 were developed to monitor water and sediment quality in the Site C Reservoir and Peace River and to address the management questions listed in the FAHMFP; several years of data collection are required before the questions can be definitively addressed. This report presents the fourth year of data collection for these two monitoring programs under the FAHMFP.

The Mon-8 study area includes monthly monitoring from May to October at eight stations within the Site C reach, defined as the portion of the Peace River that will be inundated by the Project and includes the Peace River from the Peace Canyon Dam downstream to the Site C Dam, and those sections of the Halfway and Moberly rivers that will be inundated following reservoir creation. Four reference stations were selected for monthly monitoring (May to October) to monitor water flowing into the Site C reach and are located near the Dinosaur and Williston reservoir outlets. The Mon-9 study area includes monthly monitoring from May to October at nine stations within the Peace River downstream of the Project to Many Islands, Alberta.

Similar, but to a lesser extent than that reported in 2017 and 2018, DOC concentrations in 2019 very occasionally were elevated above TOC concentrations. DOC concentrations of field blank samples collected during all sampling periods were reported to be below detection in field-filtered deionized water provided by the lab, which indicates field methodologies are not introducing cross contamination between samples. In 2017, SEES JV implemented flushing of the field equipment with a goal to reduce the incidence of false positives for DOC. In 2018 and 2019, SEES JV continued with this methodology, flushing with 1L of water in 2018, and increasing it to 2L of water in 2019. Although the concern of organic carbon impacts from field equipment has still not been fully resolved, improvements continue to be seen in 2019. The TOC concentrations are considered stable and mostly within natural levels for a lotic/lentic system with elevated background turbidity conditions (BC MELP 1998).

Overall, water quality parameters were consistently below the guidelines. During the May sampling period, regular exceedances of total iron and intermittent exceedances of temperature, copper, total zinc, dissolved aluminum and dissolved iron were observed. During the October sampling period, regular exceedances of total iron and dissolved aluminum and intermittent exceedances of dissolved iron were observed. Regular exceedances of temperature were recorded in June and July, and intermittent temperature exceedances were recorded in May and August. During the August sampling period, regular pH exceedances were observed.

Sediment quality parameters were consistently below the applicable BC Working Water Quality Guidelines for sediment except for regular exceedances of arsenic and nickel and intermittent exceedances of cadmium, iron and manganese. Source(s) of the exceeded parameters could not be conclusively determined. Many Peace River tributaries are large systems characterized by high, vertical banks composed of fine materials which are subject to erosion during high flow periods. Given the location and parameters involved, it is possible that the exceedances are the result of natural processes (i.e., regional geology and erosion) and process error (i.e., natural variability among years). The 2019 results are comparable to 2016, 2017 and 2018 results in that most parameters were below the guidelines with some exceedances in water metals parameters (i.e., iron, copper, zinc and aluminum) and some exceedances in sediment metals parameters (i.e., arsenic, cadmium, iron, manganese and nickel).

Each of the broad geospatial groups (Peace River, tributaries and reservoir) have unique geological and limnological characteristics that likely contribute to their water quality characteristics. Most notably:

- Reservoir sites are more lentic, which tend to be warmer, less oxygenated and less turbid (particulate matter has time to settle out). Parameter concentrations at the reservoir sites were generally lower than the Peace River or tributary sites which are located downstream of the Dinosaur Reservoir; and
- Tributary sites are located on tributaries to the Peace River which tend to flow through more erodible material. Notwithstanding other factors, water flowing over erodible surfaces tend to accumulate larger sediment loads and consequently may have higher total and dissolved mineral components.

Consistent with the results from previous years, May typically showed the greatest variability or spread for all parameters in all groups. The most extreme minimum and maximum values usually appeared in May through June; August also showed frequent extremes and outliers. Median concentrations of all parameters in all groups were also typically highest in May. May's variability and extreme values are likely the influence of spring freshet when more sediment and organics are disturbed within or contributed to the watercourses.

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of British Columbia Hydro and Power Authority and their agents. Saulteau EBA Environmental Services Joint Venture (SEES JV) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than British Columbia Hydro and Power Authority, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in Appendix A or Contractual Terms and Conditions executed by both parties.

1.0 BACKGROUND

As part of the Water and Sediment Quality Monitoring Programs, the Saulteau EBA Environmental Services Joint Venture (SEES JV) conducted water and sediment quality sampling (May to October 2019) associated with the Site C Clean Energy Project (the Project) on behalf of the BC Hydro and Power Authority (BC Hydro).

Historical baseline data collected in 2007, 2008, 2010, 2011, and 2015 were used as a design template to establish site locations, sampling frequency, and parameters analyzed for the Project. Historical data is documented within the "Site C Clean Energy Project Environmental Impact Statement Technical Appendix: Water Quality Baseline Conditions in the Peace River Volume 2 Appendix E" (Golder 2012). Upon collection of field data in 2019, SEES JV, in consultation with BC Hydro, determined that data were sufficient to graphically represent in boxplots and provide a basic qualitative discussion of temporal and spatial results. The analysis incorporated historical baseline data for comparative purposes.

In accordance with Provincial Environmental Assessment Certificate Condition No. 7[1] for the Project, BC Hydro produced the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP[2]). The FAHMFP includes two monitoring programs focused on assessment of Project effects on water and sediment quality:

- Site C Mon-8 – Site C Reservoir Water and Sediment Quality Monitoring Program. This program will investigate the effects of reservoir formation on water and sediment quality; and
- Site C Mon-9 – Peace River Water and Sediment Quality Monitoring Program. This program will investigate the effects of the Project on water and sediment quality in the Peace River downstream of the Project.

Mon-8 and Mon-9 conduct sampling in Construction Years 2 to 10 (2016 to 2024) and Operation Years 1 to 10 (2024 to 2033). This report is an overview of the Mon-8 and Mon-9 sampling conducted in Construction Year 5 (2019) from May to October.

The Project is located along the Peace River near the City of Fort St. John between the Districts of Hudson's Hope and Taylor, BC, accessible via Highways 97 and 29. A station location map is provided as Figure 1. All surface water monitoring stations (stations) are accessible by boat via public boat launch (road accessible). Station locations are shown in Figures 2a and 2b.

The Mon-8 study area includes monthly monitoring from May to October at eight stations within the Site C reach, defined as the portion of the Peace River that will be inundated by the Project and includes the Peace River from the Peace Canyon Dam downstream to the Site C Dam, and those sections of the Halfway and Moberly rivers that will be inundated following reservoir creation (approximately 10 km sections). Two of the eight stations are in the upstream reaches of the Halfway and Moberly rivers and will be sampled following reservoir filling in 2023 and 2024. Four reference stations (two shallow and two deep) were selected for monthly monitoring (May to October) to monitor water flowing into the Site C reach and are located near the Dinosaur and Williston reservoir outlets.

The Mon-9 study area includes monthly monitoring from May to October at nine stations within the Peace River from the Project downstream to the Many Islands area in Alberta, approximately 120 km.

[1] The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNRORD, to assess the need to adjust those measures to adequately mitigate the Project's effects.[2] Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program available at https://www.sitecproject.com/document-library/environmental-management-plans-and-reports

[2] Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program available at https://www.sitecproject.com/document-library/environmental-management-plans-and-reports

1.1 Program Objectives

The objectives of Mon-8 and Mon-9 in 2019 were to:

- Provide a qualitative description of the field site conditions, including representative photographs and geospatially referenced locations of each station;
- Collect field-measured and laboratory-analyzed parameters at each station;
- Provide a description of potential sources of error and steps taken as part of quality assurance; and
- Present the tabulated data in comparison to guidelines considered applicable to the monitoring programs.

Sampling under these programs will contribute to the information used to address the following primary fisheries management questions listed in the FAHMFP:

- Mon-8: Does the construction and operation of the Project affect fish and fish habitat (as measured through water and sediment quality) in the reservoir and lower sections of reservoir tributaries?
- Mon-9: Does the construction and operation of the Project affect fish and fish habitat (as measured through water and sediment quality) in the Peace River downstream of the Project?

These broad questions require several smaller questions to be answered because of the various ways that the Project can affect fish and fish habitat:

Mon-8:

1. Is there a change in water or sediment quality in the Site C reach during the construction of the Project?
2. Is there a change in water or sediment quality in the Site C reach during the operation of the Project?
3. How effective are proposed mitigation methods in maintaining/protecting water and sediment quality in the Site C reach?

Mon-9:

1. Is there a change in water or sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta during the construction of the Project?
2. Is there a change in water or sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta during the operation of the Project?
3. How effective are proposed mitigation methods in maintaining/protecting water and sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta?

1.2 Management Hypotheses

To address the fisheries management questions, the programs will test the following hypotheses, as provided in the monitoring plan:

Mon-8:

H_1: During construction, modeled water quality predictions presented in the Environmental Impact Statement (EIS) are like measured water quality in the Site C reach;

H_2: During operation, modeled water quality predictions presented in the EIS are like measured water quality in the Site C reach;

H_3: During construction, water and sediment quality for non-modeled parameters remain within background ranges of concentrations or comply with relevant environmental guidelines in the Site C reach; and

H_4: During operation, water and sediment quality for non-modeled parameters remain within background ranges of concentrations or comply with relevant environmental guidelines in the Site C reach.

Two hypotheses related to the effectiveness of mitigation measures for water and sediment quality are:

H_5: During construction, mitigation methods employed are effective in maintaining/protecting water and sediment quality in the Site C reach; and

H_6: During operation, mitigation methods employed are effective in maintaining/protecting water and sediment quality in the Site C reach.

Mon-9:

H_1: During construction, modeled water quality predictions presented in the EIS are similar to measured water quality in the Peace River between the Site C dam site and the Many Islands area in Alberta;

H_2: During operation, modeled water quality predictions presented in the EIS are similar to measured water quality in the Peace River between the Site C dam site and the Many Islands area in Alberta;

H_3: During construction, water and sediment quality for non-modeled parameters remain within background ranges of concentrations or comply with relevant environmental guidelines in the Peace River between the Site C dam site and the Many Islands area in Alberta; and

H_4: During operation, water and sediment quality for non-modeled parameters remain within background ranges of concentrations or comply with relevant environmental guidelines in the Peace River between the Site C dam site and the Many Islands area in Alberta.

Two hypotheses related to the effectiveness of mitigation measures for water and sediment quality are:

H_5: During construction, mitigation methods employed are effective in maintaining/protecting water and sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta; and

H_6: During operation, mitigation methods employed are effective in maintaining/protecting water and sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta.

The fisheries management questions and management hypotheses require several years of data to be collected before the questions can be definitively addressed. This report is the fourth year of data collection for these programs under the FAHMFP.

2.0 METHODS

2.1 Field Methods

To maintain compliance with the objectives listed in the FAHMFP, we developed field sampling methodology for collecting water and sediment quality data representative of 17 stations included within the program. Standard practices available from the British Columbia Field Sampling Manual (BC MOE 2013) were used to develop the following procedures:

- Sampling within surface water flow and away from the watercourse banks provides information on the quality of the channel flow and a general overview of water quality in the system. Areas of unusual flow characteristics (e.g., eddies or backwater areas) or floating debris were avoided;
- Samples were collected from near the bow via the side access of a jet engine boat, pointing the vessel upstream to collect upstream flow representative samples and to avoid contamination that could be introduced to the sample from the vessel;
  - In September 2017, as per BC Hydro direction, collection by grab sampling (i.e., submerging sample bottle directly into flow 0.2 m below surface from the side of the vessel) was replaced by a peristaltic pump and HDPE tubing with a 5 m intake length. In October 2017, the peristaltic pump was replaced with an electric diaphragm-operated pump (Pentair Shurflo; Model 4048-153-E75) and inert platinum-rinsed silicone tubing operating at 15 L/minute. The purpose of this apparatus was for collecting and analyzing low-level concentrations of dissolved and total forms of mercury and methylmercury but was inherently used for collecting all water samples. The extension of the tubing allowed samples to be collected at least 5 m away from the aluminum hull of the jet boat, which could impact the results of low-level metals analysis.
- All samples were collected by boat, except for instances of low water conditions preventing boat access. In this case, samples were collected from the shore either by wading into the water towards the centre of channel or using a telescopic metal pole with a plastic container attached for collecting the water sample from flowing water conditions within the channel;
- Water quality samples were collected from each station within 0.2 m depth from surface;
- Water quality samples within the reservoirs were collected at least 25 m from the shoreline, within the middle of the reservoir towards the outlet. The shallow samples to be submitted for laboratory analysis from the reservoirs were collected within 0.2 m depth from the surface while the deep samples were collected at a depth of 5.0 m. Depth profiles were determined by measuring field parameters throughout the water column. Depth profile sample data were recorded at 0.5 m increments between 0.2 m and 5.0 m;
- Water quality samples were collected monthly from each station between May and October 2019; the first and final sampling periods included more extensive analytical testing than others;
- Sediment quality samples were collected from nearshore depositional areas of each lotic and lentic station during the October sampling period using primarily an Ekman sampling device. However, if field conditions weren't conducive for use of this device, a small spaded shovel was used to collect samples from the nearshore. Depths of samples were determined in the field resulting from accessibility and obtaining samples representative of adequate quantities of sediment deposition within the water body (i.e., low coarse material content). Sediment collected with either the Eckman or shovel were composited within a Rubbermaid tote and samples placed in laboratory supplied jars/bags;
- *In situ* surface water quality measurements were determined using with a YSI ProDSS Multimeter or YSI EXO Multimeter, both of which record sample depth, specific conductivity, electrical conductivity, pH, temperature, dissolved oxygen, salinity, Total Dissolved Solids (TDS) and turbidity of the source water;

- Water transparency within the reservoirs was recorded by measuring the depth of visibility of a Secchi disk;
- Where possible, laboratory analyte bottles were filled directly from the water source and/or tube sampling port to minimize cross contamination of samples collected at each station (i.e., surface water). Where additional handling was required, a new 500 mL plastic bottle (i.e., routine sample bottle) was filled from the source, and sample water was decanted into other laboratory analysis bottles or filters. Depth profile samples were collected by weighing tubing down to the required depth by use of buoy and weight. The introduction of the diaphragm pump collection method made direct filling of each laboratory analyte bottle possible without additional handling, including deep-water sample collection. The methodology for collecting depth profile measurements was developed in consultation with BC Hydro and with reference to the British Columbia Field Sampling Manual (BC MOE 2013);
- Decontamination of tubing was completed at each site by running source water through the tubing for a minimum of 15 minutes prior to sampling. When grab sampling was required, decontamination of sampling equipment between monitoring locations was completed by triple rinsing field sample collecting equipment;
- The use of clean, new nitrile gloves and filters at each new monitoring location during all water sampling;
- Required preservatives were added into the sample containers (e.g., dissolved metals and total metals – nitric acid, dissolved and total nutrients – sulfuric acid, dissolved and total mercury – hydrochloric acid);
- Dissolved parameters were filtered in the field using new high capacity Waterra filters and then were field preserved after filtration;
- The sample ID, date and location on container label were recorded using water resistant labelling;
- One blind duplicate sample was submitted per every 10 ambient samples submitted;
- One trip blank and one field blank were submitted per sampling period, unless otherwise noted;
- Samples were stored in a cooler with ice packs to lower temperature and maintain them below 4°C;
- All field activities were recorded on formatted field data sheets concurrently with ongoing field activities and supported by GPS referencing at each monitoring station;
- Chain-of-custody forms including analytical selection were completed for the samples. The analytical testing for the 2019 monitoring Program is derived from the British Columbia Approved and Working Water Quality Guidelines (BC MOE 2017 and 2019); and
- Samples were delivered to the ALS Environmental laboratory depot in Fort St. John, BC.

Tables 1 and 2 in the Appendix summarize selected parameters from the program; the list is based on sampled parameters represented by available BC Water Quality Guidelines (BC WQG), subsequently discussed within the Results (Section 4.0). Note that the BC WQG does not include guidelines for all parameters included in the program (BC MOE 2019).

Field parameter measurements and laboratory analytical results have been compiled in Tables 3 to 11 in the Appendix; Laboratory Certificates of Analysis are included in Appendix B. Table 2-1 summarizes parameters sampled and collection periods for the program.

Table 2-1. Laboratory Analyzed Parameters and Sampling Collection Periods

Parameters Sampled	Sampling Period					
	May 23 to 26, 2019	**June 22 to 25, 2019**	**July 23 to 26, 2019**	**August 20 to 23, 2019**	**September 24 to 27, 2019**	**October 22 to 26, 2019**
Surface Water Parameters Sampled: Colour, alkalinity, pH, total dissolved solids, total suspended solids, dissolved organic carbon, total organic carbon, ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen, total phosphorus, total dissolved phosphorus, soluble reactive phosphorus	All Stations	All Stations	All Stations	All Stations	All Stations	All Stations
Surface Water Parameters Sampled: Major ions (calcium, magnesium, potassium, sodium), total and dissolved metals and metalloids (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, methylmercury, molybdenum, nickel, selenium, silver, thallium, tin, titanium, uranium, vanadium, and zinc)	All Stations					All Stations
Surface Water Parameters Sampled: Low-level analysis of total and dissolved forms of mercury and methylmercury	All Stations					All Stations
Surface Water Parameters Sampled: Chlorophyll *a*	W1 and D1 (Deep and Shallow)	W1 and D1 (Deep and Shallow)	W1 and D1 (Deep and Shallow)	W1 and D1 (Deep and Shallow)	W1 and D1 (Deep and Shallow)	W1 and D1 (Deep and Shallow)
Sediment Parameters Sampled: Particle size, nutrients, and total metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, tin, titanium, uranium, vanadium, and zinc)						All Stations

2.2 Boxplot Analysis Methods

Boxplots, constructed using Microsoft Excel 2016 (attached Figures 3 to 7), were used to graphically depict the water quality data. In consultation with BC Hydro, five of the 19 parameters were selected for plotting: total nitrogen, total phosphorus, total organic carbon (TOC), total iron and chlorophyll *a*. A total of 19[3] sites were divided into five groups based on location (Table 2-2):

[3] Following the 2016 field season, the SEES JV sought approval from BC Hydro, that Halfway River Upstream (HU) and Moberly River Upstream (MU) would not be sampled until reservoir inundation due to access restrictions related to turbulent water conditions carrying large debris (i.e., safety hazard) or low water levels making the river impassable by boat. Following reservoir filling, HU and MU will be incorporated into the program again.

Table 2-2: Included Sites for Boxplot Representation

Reservoir	Peace River		Tributaries	
	Upstream of Dam	Downstream of Dam	Upstream of Dam	Downstream or Dam
Williston Deep (W1-Deep)	Peace Canyon Dam (PC1)	Peace at Pine (PD1)	Halfway River-Downstream (HD)	Pine River (PINE)
Williston Shallow (W1-Shallow)	Peace 1: Site C Reservoir (PR1)	Peace at Beatton (PD2)	Moberly River – Downstream (MD)	Beatton River (BEA)
Dinosaur Deep (D1-Deep)	Peace 2: Middle Site C Reservoir (PR2)	Peace at Kiskatinaw (PD3)		Kiskatinaw River (KR)
Dinosaur Shallow (D1-Shallow)	Peace 3: Lower Site C Reservoir (PR3)	Peace at Pouce Coupe (PD4)		Pouce Coupe River (POUCE)
		Peace at Many Islands (PD5)		

Data from each group were divided into Pre-Construction phase (July 27, 2015 and earlier) and Construction phase (after July 27, 2015). Where available, data for sampling conducted between May and October were included for each phase, where results from each month are referred to as “periods”.

The following data sets were plotted:

- Pre-Construction phase:
  - Data collected in 2007, 2008, 2010, 2011 and 2015 sourced from: “Site C Clean Energy Project Environmental Impact Statement Technical Appendix: Water Quality Baseline Conditions in the Peace River Volume 2, Appendix E” (Golder 2012).
- Construction phase:
  - Data collected in 2016 sourced from: “Peace River and Site C Reservoir 2016 Water and Sediment Quality Monitoring Programs” (SEES JV 2017);
  - Data collected in 2017 sourced from: “Peace River Water Quality in the Vicinity of the Confluence with the Moberly River – Seasonal Trends in Metals that have British Columbia Water Quality Guidelines for the Protection of Aquatic Life” (Ecofish 2017);
  - Data collected in 2017 sourced from: “Peace River and Site C Reservoir 2017 Water and Sediment Quality Monitoring Programs” (SEES JV 2018);
  - Data collected in 2018 sourced from: “Peace River and Site C Reservoir 2018 Water and Sediment Quality Monitoring Programs” (SEES JV 2019); and
  - SEES JV’s 2019 water quality data.

Summary statistics (Table 15) were also compiled for each of the groups and include: Mean, Standard Error, Median, Mode, Standard Deviation, Sample Variance, Kurtosis, Skewness, Range, Minimum, Maximum, Sum and Count.

3.0 REGULATORY GUIDELINES

"The British Columbia Water Quality Guidelines (WQG) provide policy direction to those making decisions affecting water quality. Although WQGs do not have any direct legal standing, once approved, WQGs must be considered in any decision affecting water quality made within the British Columbia Ministry of Environment (BC MOE). WQGs are used to assess water quality and may be used as the basis for determining the allowable limits in waste discharge authorizations. Exceeding a WQG does not imply that unacceptable risk exists, but rather that the potential for adverse effects may be increased and additional investigation may be required" (BC MOE 2019). Table 3-1 describes the application of the regulatory guidelines used in comparison with the Program data.

Table 3-1. Application of Regulatory Guidelines within the Program

Regulatory Guideline	Monitoring Program Results Guidelines were Compared With	Rationale for Use
British Columbia Approved Water Quality Guidelines (BC AWQG), for freshwater aquatic life and short-term maximums (BC MOE 2019)	All surface water quality results	The overall guidelines were developed to represent safe levels of substances that protect different water uses, including: drinking water, recreation, aquatic life, wildlife, and agriculture. Short-term maximum or "acute" guidelines are set to protect against severe effects such as lethality or other equivalents to the most sensitive species and life stage over a defined short-term exposure period (BC MOE 2019). The requirement for applying long-term average guidelines is that five samples are collected at a station over a 30-day period.
British Columbia Working Water Quality Guidelines (BC WWQG; BC MOE 2017)	No application to surface water quality results	The BC WWQG were reviewed and determined not to be applicable for water quality parameters based on the sampling frequency selected (e.g., sampled parameters were presented as long-term averages within the guidelines, which do not apply to monitoring Program sampling frequency).
British Columbia Working Water Quality Guidelines (BC WWQG; BC MOE 2017)	Sediment quality results	The sediment quality results were compared to the BC WWQG because approved guidelines for sediment quality are not available. The BC WWQG for sediment quality parameters are applied using lower and upper surface water quality guidelines (SWQG). The Lower SWQG is based on "a concentration set to protect aquatic life from adverse effects of a toxic substance in most situations and is equivalent to the Canadian Council of Ministers of the Environment's (CCME) Threshold Effect Level or Interim Sediment Quality Guidelines (TEL or ISQGs; CCME 2001a)". The Upper SWQGs is based on "a concentration that if exceeded will likely cause severe effects on aquatic life (equivalent to CCME's Probable Effect Level (PEL; CCME 2001a)". As the guidelines are considered a working document, caution in applying the guidelines should be exercised. The sediment quality guidelines within the BC WWQG are based on levels of toxic substances found in the sediment where biological effects have been measured and are not based on cause-effect studies (BC MOE 2017).

Guidelines determined to be applicable to the analyzed parameters were compiled from the BC AWQG and BC WWQG and are presented in Tables 1 and 2. Guidelines for cadmium, copper, fluoride, lead, manganese, silver, and zinc are provided, where applicable, in Tables 3 to 11 as a referenced equation, which vary with hardness, pH, and temperature. Parameter-specific equations used to calculate the applicable guideline values are provided in the notes of the tables.

4.0 RESULTS

Results, both *in situ* and laboratory, were compared among the sampling periods and among stations (from upstream to downstream reaches). The objective of plotting the data was to start to identify differences and parameter concentrations that differ from guidelines.

Water quality results are presented in Tables 3 to 11 and Appendix B (laboratory reports), attached to this report, and include the following for each sampling location:

- Field parameter measurements and field observations;
- Laboratory analytical results for each sample submitted, including duplicate, trip blank, and field blank analysis; and
- Exceedances of the BC AWQG and BC WWQG are bolded and shaded in grey.

The GPS coordinates of each station are provided in Figures 2a and 2b. Photographs of the stations (Photos 1 to 17) are presented within the Photograph section of this report.

4.1 Williston and Dinosaur Reservoirs Water and Sediment Quality Results

Four reference stations were selected to monitor water flowing into the Site C reach from Dinosaur and Williston reservoirs.

Reference Station Sample IDs:

- Williston (W1) – Deep and Shallow; and
- Dinosaur (D1) – Deep and Shallow.

Sediment quality samples were collected for D1 and W1 within the near-shore littoral zones near the water sample locations to collect samples with a high fine to coarse material ratio. Particle size analysis of each sample determined that Dinosaur Reservoir and Williston Reservoir sediments were classified as sandy loam and silt loam, respectively (Table 5; Appendix B).

Reservoir depth profiles for W1 and D1 are provided in Tables 3 and 4; reservoir sediment quality results for W1 and D1 are presented in Table 5. Surface water quality results for both W1 and D1 (Shallow and Deep samples) are presented monthly in Tables 6 to 11; all lab results are located in Appendix B.

Throughout the sampling periods, field measured dissolved oxygen, electrical conductivity and specific electrical conductivity remained generally stable within both W1 and D1; dissolved oxygen levels decreased slightly throughout the sampling periods but remained within guidelines and supportive of aquatic life. Field measured water temperatures generally increased then decreased with the seasonal changes from May to October; surface temperatures exceeded BC AWQG in July at D1 and W1. Throughout the water column, temperatures generally decreased with depth in the summer months, however a distinct hypolimnion was not identified as there was no clear stratification observed within the top 5 m at any time. Within the Williston Reservoir, the thermocline would likely have existed below a depth of 5 m during the months of July and August. As was the case in prior years, measurements collected in July, August and September were the most elevated temperatures recorded over the course of each sampling period (Tables 3 and 4). In the spring and fall months (May, September and October), the water column in both reservoirs was uniformly mixed with consistent temperatures existing throughout the upper 5 m of the reservoirs.

With the exception of the field-measured pH values within the Dinosaur Reservoir in August, the pH values remained within guidelines throughout the water column measurements for both reservoirs over the course of each sampling period. Since field-measured pH results were consistently low for many of the 19 sampling locations in August, and the lab-measured pH values for these sites were within typical ranges observed throughout the rest of the 2019 sampling period, it is probable that the pH meter was malfunctioning during this sampling event. It should be noted that laboratory-analyzed pH is considered secondary to field-measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratory analyzed pH values. Hardness concentrations ranged from 91.0 mg/L to 97.4 mg/L for samples collected within the reservoirs in May and October, which is considered moderately soft/hard to hard water (ESRD 2018; Tables 6 and 11).

Colour, TSS, TDS, and turbidity were moderate to low throughout the dataset and over each sampling period. As was observed in 2018, D1 experienced a slight increase in turbidity during the May and August sampling periods (Tables 6 to 11). The increase could be attributable to the operation of W.A.C Bennett and Peace Canyon Dams for the management of water levels. Secchi depths ranged from 1.5 m to 6.0 m below surface for D1 and 3.0 m to 6.5 m for W1 (Tables 3 and 4). The lower secchi readings at D1 occurred in May and August which is consistent with the slightly elevated turbidity results observed within the Dinosaur Reservoir during those months.

Since the BC AWQG for turbidity and TSS rely on daily sample collection over a 30-day period (for long-term average guideline) or the use of automated data collection over a 24-hour period (short-term maximum guideline), the individual samples collected in 2019 were not compared to guidelines.

Anions and nutrients analyzed within the lentic (reservoir) dataset did not exceed available guidelines. TOC concentrations were within normal range (1 mg/L to 30 mg/L) for natural waterbodies (BC MELP 1998). Boxplots showed that median TOC concentrations measured in the reservoirs during the Construction phase are generally highest in May but are relatively consistent (approximately 3 mg/L) throughout the sampling period (Figure 7). In fewer instances than was the case in prior years, dissolved organic carbon (DOC) concentrations were found to exceed the TOC concentration, which was attributed to the use of polyethersulfone based filters and is discussed within Section 5.0 (Discussion) of this report (Tables 6 to 11). Since the fluctuations between DOC and TOC concentrations in 2019 are consistently negligible, the difference could also be attributed to unavoidable analytic variation that is present in all lab tests. This inherent accuracy becomes more significant near the upper and lower limits of detection.

Two nutrients were plotted – nitrogen and phosphorus (Figures 5 and 6). Median concentrations of both nitrogen and phosphorus within the reservoirs were similar throughout all periods in the Construction phase. Median concentrations observed in May were slightly higher and had a greater range of values. Nitrogen and phosphorus concentrations in the Pre-Construction phase were, however, dissimilar. Median concentrations of nitrogen in the Pre-Construction phase were more variable across the periods and showed a wide range of values (greater distance between minimum and maximum concentrations) compared to the Construction phase. Pre-Construction median concentrations of phosphorus were similar across the periods and were comparable to the Construction phase.

Chlorophyll *a* was included as a parameter for boxplot analysis since it is commonly used as an indicator of algae abundance and productivity in aquatic environments (Figure 3). Median concentrations of Chlorophyll *a* within the reservoirs generally increased between May and October. Chlorophyll *a* concentrations are commonly highest during the warm, sunny summer months (i.e., June through August), however, in this dataset, those months actually saw a decrease in median concentration. September and October had the highest median concentrations of Chlorophyll *a* which has been consistent throughout the four years of the Construction phase as was illustrated in the 2018 boxplots inclusive of the 2016-2018 data.

Total and dissolved metals and metalloid analysis for water quality was conducted for May and October sampling periods only. No exceedances of guidelines were observed within the lentic dataset for metals or metalloid parameters (Tables 6 and 11). Boxplots of iron in the reservoirs during the Construction phase show that median

concentrations are highest in May – likely the result of sediments contributed during spring freshet – then very low (less than 0.1 mg/L) in the fall (Figure 4). Pre-Construction phase median concentrations were more stable, with a peak in August.

All samples analyzed for ultra-low-level detection of mercury and methylmercury resulted in concentrations either below or marginally above the detection limits (Tables 6 and 11).

Other than the temperature readings which occasionally exceeded the BC AWQG and the abnormally low pH readings in August, no other exceedances of the guidelines were observed within the datasets (Tables 6 to 11).

Sediment anions and nutrient levels were considered moderately low and close to detection limits, and pH was within a normal range during the one sampling event in which sediments were sampled (October). W1 exceeded the Lower Sediment Water Quality Guideline (SWQG) guidelines for arsenic, cadmium and nickel; D1 exceeded the Lower SWQG guidelines for arsenic, cadmium, and nickel. No metal concentrations within sediments collected from either reservoir exceeded the Upper SWQC (Table 5).

Other than the metal exceedances stated, no other exceedances of the BC WWQG were observed in 2019.

4.2 Peace River Water Quality Results: Site C Reservoir

The Mon-8 study area includes monthly monitoring from May to October at eight stations within the Site C reach, defined as the portion of the Peace River that will be inundated by the Project and includes the Peace River from the Peace Canyon Dam downstream to the Site C Dam, and those sections of the Halfway and Moberly rivers that will be inundated following reservoir creation (approximately 10 km sections).

Site C Reservoir Station IDs:

- Peace Canyon (PC1);
- Upper Site C Reservoir (PR1);
- Middle Site C Reservoir (PR2);
- Halfway River Upstream (HU) and Downstream (HD);
- Lower Site C Reservoir (PR3); and
- Moberly River Upstream (MU) and Downstream (MD).

PC1 is considered the most upstream sample location and PR3 and MD (tributary) are considered the most downstream sample locations within the future Site C Reservoir. Samples were collected from designated stations relating to the sample names. Peace River samples were collected from mid-channel flow locations, isolating source water considered to be well mixed within the Peace River. Tributary river samples were collected upstream of the Peace River confluence to isolate mid-channel flow source prior to it mixing with the main Peace River channel.

All water quality parameters analyzed were within the BC AWQG guidelines for the samples collected during 2019 except for intermittent exceedances above the guidelines for temperature, pH, total iron and dissolved aluminum.

Field measurements of temperature from PC1 and MD in June and July indicated levels exceeding the BC AWQG (Tables 7 and 8). In addition, field measurement of temperature from HD in July indicated an exceedance of the BC AWQG (Table 8). Overall, the temperatures measured within tributaries were found to be higher than that of the Peace River, except for the September and October sampling periods when temperatures within the tributaries were lower relative to Peace River values.

pH values remained within guidelines in 2019, except for three measurements during the August sampling period which were unusually low due to a potential equipment malfunction (discussed in Section 4.1). Laboratory-analyzed pH is considered secondary to field-measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratory-analyzed pH values (Tables 6 to 11).

TSS, TDS, and turbidity were consistent throughout the dataset and over each sample period, with elevated concentrations observed within the tributaries (HD and MD) and slightly elevated concentrations within the Peace River downstream of the tributaries. Overall, turbidity was the highest in the months of May and August. These parameters were not compared against BC AWQG, as short-term maximum guidelines were not provided in the guidelines (Tables 6 to 11).

Anions and nutrients analyzed within the dataset did not exceed the BC AWQG, however results for the tributary source waters (i.e., HD and MD) were generally observed to be elevated relative to the Peace River samples. TOC concentrations were within normal range (1 mg/L to 30 mg/L) for natural waterbodies (BC MELP 1998; Tables 6 to 11).

For both Tributaries Upstream and Peace River Upstream sites, median TOC concentrations were highest in May in both the Pre-Construction and Construction phases, though the peak was more distinct in the Peace River Upstream sites (Figure 7). Throughout the rest of the sampling periods, median TOC concentrations were reasonably consistent in both the Pre-Construction and Construction phases. TOC concentrations were generally lower in the Peace River Upstream sites compared to those in the Tributaries Upstream sites, at just less than 5 mg/L *vs* just over 5 mg/L, respectively. DOC concentrations were occasionally found to exceed the TOC concentration on a very limited basis, which was likely attributable to the use of polyethersulfone based filters and is discussed further within Section 5 of this report.

Nitrogen and phosphorus both showed the same general trends in Pre-Construction and Construction phases and between sites (Figures 5 and 6). Concentrations of both these parameters were fairly consistent at the Peace River Upstream sites throughout all periods. However, the Tributaries Upstream sites have a distinct peak in May with consistent median concentrations throughout the other periods. For the Construction phase, median concentrations of nitrogen were slightly higher in the Tributary sites compared to the Peace River sites. Median concentrations of phosphorus, however, were much higher in the Peace River sites compared to the Tributary sites.

Pre-Construction phase median concentrations of Chlorophyll *a* were fairly consistent throughout all sampling periods in both Peace River and Tributary Upstream sites (Figure 3). Construction phase sampling is more limited, with samples collected in only May 2016 at the Peace River Upstream sites and in May and June 2016 at the Tributaries sites. During this time, the median concentration nearly doubled from May to June at the Tributary sites.

Hardness varied between 91.3 mg/L to 214.0 mg/L for samples collected during the May and October sampling periods, which ranged from moderately soft to very hard water (ESRD 2018; Tables 6 and 11). Hardness within the tributary source waters was generally higher than that of the Peace River and hardness within the Peace River increased downstream of PR2.

Intermittent samples analyzed throughout the May and October sampling periods exceeded the BC AWQG for total iron (Tables 6 and 11). In May, the HD, PR3 and MD samples exceeded guidelines for iron, and in October, the tributary (HD and MD) samples exceeded guidelines for total iron. Iron is a naturally occurring element due to the weathering of rocks and minerals but has also been associated with acidic mine water drainage, landfill leachates, sewage effluents and iron-related industries (Health Canada 1978).

The tributary (HD and MD) samples collected in October exceeded the BC AWQG for dissolved aluminum (Table 11). Aluminum is a naturally occurring element due to erosion of watershed areas and is also used as a coagulant in drinking water treatment facilities (BC MOEAP 1988).

All samples analyzed for ultra-low-level detection of mercury and methylmercury resulted in concentrations either below or within an order of magnitude of detection limits with the tributaries and PR3 having higher concentrations than PC1, PR1 and PR2 (Tables 6 and 11).

Median concentrations of iron in both the Peace River and Tributaries sites showed a generally decreasing trend for both the Pre-Construction and Construction phases from May to October (Figure 4). The decreasing trend was more distinct during the Construction phase. For the data collected in May during the Construction phase, the median iron concentration exceeded the BC AWQG guidelines of 1 mg/L; subsequent periods were generally below the BC AWQG guideline.

Other than total iron, dissolved aluminum, temperature and pH exceeding the BC AWQG, no other exceedances of the guidelines were observed within the datasets.

Sediment quality samples were collected for all Site C Reservoir samples within the near-shore littoral zones near the water sample locations to collect samples with a high fine to moderately coarse material. Particle size analysis of each sample determined that sediment varied between silt loam, loamy sand, and sand soil textures (Table 5; Appendix B).

Sediment anions and nutrient levels were considered moderately low and close to detection limits, except for ammonium at PR3 which was elevated relative to the remainder of the future Site C Reservoir dataset. pH was within a normal range for all samples. The BC WWQG Lower SWQG were exceeded for arsenic (PC1, PR1, PR2, HD, PR3 and MD), cadmium (PR3), iron (PC1, PR1, HD, and MD) and nickel (PC1, PR1, PR2, HD, PR3 and MD). No metal concentrations within sediments collected from the Site C reach exceeded the Upper SWQC (Table 5).

Other than the metal exceedances stated, no other exceedances of the BC WWQG were observed within the 2019 datasets.

4.3 Peace River Water Quality Results: Downstream Reach

The Mon-9 study area includes monthly monitoring from May to October of nine stations within the Peace River from the Site C Dam downstream to the Many Islands area in Alberta, approximately 120 km.

Downstream Reach Station IDs:

- Peace at Pine (PD1);
- Pine River (PINE);
- Peace at Beatton (PD2);
- Beatton River (BEA);
- Peace at Kiskatinaw River (PD3);
- Kiskatinaw River (KR);
- Peace at Pouce Coupe (PD4);
- Pouce Coupe (POUCE); and
- Peace at Many Islands (PD5).

PD1 is considered the most upstream sample location and PD5 is considered the most downstream sample location within the downstream reach dataset. Samples were collected from designated stations relating to the sample names. Peace River samples were collected from mid-channel flow locations, isolating source water considered to be well mixed within the Peace River. Tributary river samples were collected upstream of the Peace River confluence to isolate mid-channel flow source prior to it mixing with the main Peace River channel.

All parameters analyzed met the BC AWQG for the samples collected in 2019 except for elevated temperatures encountered at a number of stations during the summer months, and intermittent exceedances above the guideline for total and dissolved iron, total copper, total zinc and dissolved aluminum. (Tables 7 to11).

Field measurements of temperature from May through August indicated levels exceeding the BC AWQG for a number of stations (Tables 6 to 9). In May and August, temperature at POUCE exceeded guidelines. In June temperature exceedances were documented at BEA and POUCE, and in July, temperature exceedances were documented at 7 sites (PINE, BEA, PD3, KR, PD4, POUCE and PD5). Overall, the temperatures measured in the tributaries were generally found to be higher than that of the Peace River, except for the September and October sampling periods when temperatures within the tributaries were slightly lower relative to the Peace River.

The pH values remained within guidelines throughout the dataset and sampling period with the exception of six sites during the August sampling period. These unusually low pH values are thought be the result of malfunctioning equipment (discussed in section 4.1). Laboratory-analyzed pH is considered secondary to field-measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratory-analyzed pH values (Tables 6 to 11).

TSS, TDS, and turbidity were generally consistent throughout the dataset and over each sample period, with elevated concentrations generally observed within the tributaries (PINE, BEA, KR and POUCE) compared to the Peace River samples. Turbidity was substantially elevated at all sites during August, and concentrations observed in May were moderately elevated compared to other sampling periods in the program (Tables 6 to 11). The elevated turbidity levels in August are likely a result of rainfall. The 9-day period between August 15 and August 23 saw 7 days of rain, with a total rainfall of 72.4 mm; the majority of which (54.4 mm) fell in the five days prior to the sampling event (August 20-23). The turbidity results were not compared against BC AWQG, as short-term maximum guidelines were not provided in the guidelines.

Anions and nutrients analyzed within the dataset did not exceed any of the BC AWQGs. TOC concentrations were within normal range (1 mg/L to 30 mg/L) for natural waterbodies, except for the BEA samples collected during the July, August, September and October sampling periods (BC MELP 1998; Tables 6 to 11). DOC concentrations were very infrequently found to exceed the TOC concentration, which was likely attributable to the use of polyethersulfone based filters and is discussed further within Section 5.0 of this report.

During the Construction phase, median TOC concentrations in the Peace River Downstream sites were highest in May (approximately 3.5 times higher) then quickly decreased and stabilized over the subsequent periods (i.e., June to October) (Figure 7). At the Tributaries Downstream sites, the median TOC concentrations were considerably higher than those at the Peace River Downstream sites. Median TOC concentrations at the Tributaries Downstream sites were also comparatively consistent, with only a slight peak in May.

In both Pre-Construction and Construction phases median concentrations of nitrogen at both Peace River Downstream and Tributaries Downstream were highest in May and then relatively consistent throughout the remaining periods (Figure 5).

Median concentrations of phosphorus were generally highest in May at both downstream sites in both phases (Figure 6). The 2019 dataset showed a distinct increase in phosphorus concentrations at both sites in August during

the Construction phase, whereas in 2018 the median concentration was consistently low after the spring freshet in May. Both the Peace River Downstream and Tributaries Downstream sites showed a noticeably lower median concentration of phosphorus in May 2019 compared to May 2018.

Hardness within the tributary source waters was generally higher than that of the Peace River during the May and October sampling periods with the exception of the BEA which had consistently softer water than the nearby Peace River location and the PINE which had softer water than the Peace River location in May but not October. Hardness varied between 58.4 mg/L to 212.0 mg/L for samples collected during the May and October sampling periods, which ranged from soft to moderately soft to very hard water (ESRD 2018; Tables 6 and 11).

All samples collected in the May sampling period exceeded the BC AWQG for total iron and five samples (PINE, BEA, KR, POUCE and PD5) exceeded the iron guidelines during the October sampling period. Two samples collected in May (PD1 and BEA) and in one sample in October (BEA) also exceeded the BC AWQG for dissolved iron (Tables 6 and 11).

Median concentrations of iron in both the Peace River and Tributaries Downstream sites showed a generally decreasing trend from May to October for both the Pre-Construction and Construction phases, with May having the highest values (Figure 4). Most median iron concentrations in both the Pre-Construction and Construction phases exceeded the BC AWQG guideline of 1 mg/L.

The BEA sample collected in May exceeded the BC AWQG for total copper (Table 6). Copper is a naturally occurring element due to the weathering of rocks and minerals (BC MOEAP 1987).

The BEA sample collected in May also exceeded the BC AWQG for total zinc (Table 6). Zinc is a naturally occurring element; however, is also related to industrial and domestic emissions (Health Canada 1987).

The PD1, BEA and PD5 samples collected in May and the PINE, BEA and POUCE samples collected in October exceeded the BC AWQG for dissolved aluminum (Tables 6 and 11).

All samples analyzed for ultra-low-level detection of mercury and methylmercury resulted in concentrations that were generally within or slightly greater than an order of magnitude above the reportable detection limits (Tables 6 and 11).

Other than intermittent exceedances above the BC AWQG for temperature, pH, total and dissolved iron, total copper, total zinc and dissolved aluminum; and all stations exceeding the BC AWQG for total iron in May, no other exceedances of the guidelines were observed within the datasets.

Sediment quality samples were collected for all downstream reach samples within the near-shore littoral zones near the water sample locations to collect samples with a high fine to moderately coarse material ratio. Particle size analysis of each sample determined that sediment varied between silt loam and sandy loam soil textures (Table 5; Appendix B).

Sediment anions and nutrient levels were considered moderately low and close to detection limits, except for ammonium at PD1 which was slightly elevated. pH was within a normal range for all samples. All samples exceeded the BC WWQG Lower SWQG for arsenic and nickel; PD1, PINE, PD3, PD4 and PD5 exceeded the BC WWQG for cadmium; POUCE exceeded the BC WWQG for Manganese; and BEA, POUCE and PD5 exceeded the BC WWQG for iron. All sediment samples collected from the Downstream Reach were within the BC WWQG Upper SWQG except for iron at POUCE which exceeded the guideline (Table 5).

Other than the metal exceedances stated, no other exceedances of the BC WWQG were observed within the 2019 datasets.

4.4 Quality Assurance and Quality Control

The quality assurance and quality control (QA/QC) programs for water and sediment quality sampling are implemented to assess and/or quantify field, laboratory and data reduction quality.

Laboratory QA/QC reports are required by environmental laboratories accredited by the Canadian Association of Environmental Analytical Laboratories (CAELA), such as ALS Environmental, and can be requested to be attached to the laboratory data or requested from the lab directly. Laboratory QA/QC data reviewed by the assessor is generally limited to percentage recovery of added surrogates. The reported detection limits (RDL) of the analytical methods are presented on the analytical reports and in Tables 12 to 14.

Field quality control includes procedures and documentation, and occasionally collection of quality assurance samples. Field quality assurance sampling programs are used to measure the precision and accuracy of the field sampling using blank and duplicate samples.

The field sampling and laboratory testing reproducibility of the sample-duplicate pairs is evaluated using the relative percentage difference (RPD) method, involving calculation of RPD as follows:

$$RPD\ \% = [Sample - Duplicate]/(X)*100$$

where X is the average concentration of the sample and its duplicate.

The duplicate analysis is compared to the sample by evaluating the RPD, where the target RPD is less than a 20% difference for water and less than a 30% difference for sediment. RPD is calculated for results that are higher than five times the reported detection limit. Results of RPD analysis are presented in Tables 12 and 13. Approximately 3.05% of all water quality parameters that qualified for RPD analysis were found to generate an exceedance of 20% RPD analysis. None of the sediment quality duplicates were found to generate an exceedance of 30% RPD analysis. The water quality exceedances were attributed to the following parameters: Nitrate and Nitrite, Nitrite, Total Nitrogen, Sulphate and Chlorophyll *a* Overall, 3% exceedance of water quality parameters is within an acceptable quality control range.

Trip or travel blanks are deionized water sealed in a bottle provided by the laboratory and are introduced for travelling with the samples for the duration of the sampling period. Elevations above the reported detection limit may indicate laboratory or transit introduced errors outside of the field methodology. Table 14 indicates that there were no elevations above reported detection limits for any parameters during the May to September sampling periods. In October, total nitrogen was reported to be 0.062 mg/L which is slightly above the reported detection limit of 0.03 mg/L.

Field blanks are deionized water filled into bottles using the same field methodology applied to the analyzed dataset. All bottles and water are provided by the laboratory and are introduced for evaluating the field methodology and potential for analytical interference using equipment or sampling practices. Elevations above the reported detection limit may indicate field level introduced errors. Table 14 indicates elevations above reported detection limits for total aluminum and total manganese in May; turbidity, total aluminum, total calcium, total mercury, dissolved calcium and dissolved manganese in June; turbidity in July; turbidity in August; total manganese in September; and total manganese in October.

The pH value reported for each field and trip blank were below the normal range of 6.5 to 9.0 and considered acidic. This is attributed to the acidity of the deionized water and not sampling and analytical methodologies. An ALS representative confirmed that the laboratory supplied deionized water typically has a low pH value. In addition, pH has a limited hold time of 15 minutes, therefore field measured pH and not laboratory analyzed pH is interpreted for data analysis of samples collected.

5.0 DISCUSSION

The objectives of Mon-8 and Mon-9 in 2019 were to contribute to the FAHMFP by characterizing the surface water and sediment conditions within the Peace River and its tributaries as it relates to the Project.

5.1 Management Hypotheses

Mon-8 and Mon-9 were developed to monitor water and sediment quality in the Site C Reservoir and Peace River to address the fisheries management questions listed in the FAHMFP (see Section 1.0).

The management questions and hypotheses outlined in Section 1.0 will require several years of data collection before the questions can be definitively addressed. This report is the fourth year of data collection for these two monitoring programs under the FAHMFP.

5.2 Discussion of Results

Each of the broad geospatial groups (Peace River, tributaries and reservoirs) have unique geological and limnological characteristics that likely contribute to their water quality characteristics. Most notably:

- Reservoir sites are lentic, which tend to be warmer, less oxygenated and less turbid (particulate matter has time to settle out) than that of lotic waters. Parameter concentrations at the reservoir sites were generally lower than the Peace River or tributary sites which are located downstream of the Dinosaur Reservoir; and
- Tributary sites are located on tributaries to the Peace River which tend to flow through more erodible material. Notwithstanding other factors, water flowing over erodible surfaces tend to accumulate larger sediment loads and consequently may have higher total and dissolved mineral components.

Similar, but to a lesser extent than that reported in 2017 and 2018, DOC concentrations in 2019 very occasionally were elevated above TOC concentrations. DOC concentrations of field blank samples collected during all sampling periods were reported to all be below detection in field-filtered deionized water provided by the lab, which indicates field methodologies are not introducing cross contamination between samples. In the 2017 and 2018 reports it was discussed that "*in 2016, one potential source of organic carbon was attributed to the field filtration equipment. ALS Environmental confirmed that this is a known contributor of organic carbon to analytical samples, and therefore, the concentrations reported are not considered to be an indicator of high concentrations of source water DOC*". In 2017, SEES JV implemented flushing of the field equipment with a goal to reduce the incidence of false positives for DOC. In 2018 and 2019, SEES JV continued with this methodology, flushing with 1L of water in 2018, and increasing it to 2L of water in 2019. Although the concern of organic carbon impacts from field equipment has still not been fully resolved, improvements continue to be seen in 2019. The TOC concentrations are considered stable and mostly within natural levels for a lotic/lentic system with elevated background turbidity conditions (BC MELP 1998).

Overall, water quality parameters were consistently below the guidelines. During the May sampling period, regular exceedances of total iron and intermittent exceedances of temperature, copper, total zinc, dissolved aluminum and dissolved iron were observed. During the October sampling period, regular exceedances of total iron and dissolved aluminum and intermittent exceedances of dissolved iron were observed. Regular exceedances of temperature were recorded in June and July, and intermittent temperature exceedances were recorded in May and August. During the August sampling period, regular pH results below the guideline range were observed but these were likely attributable to equipment malfunction.

Sediment quality parameters were consistently below the guidelines except for regular exceedances of arsenic and nickel and intermittent exceedances of cadmium, iron and manganese. Source(s) of the exceeded parameters could not be conclusively determined. Many Peace River tributaries are large systems characterized by high, vertical banks composed of fine materials which are subject to erosion during high flow periods. Given the location and parameters involved, it is possible that the exceedances are the result of natural processes (i.e., regional geology and erosion) and process error (i.e., natural variability among years).

5.3 Boxplots

Consistent with the results from previous years, May typically showed the greatest variability or spread for all parameters in all groups. The most extreme minimum and maximum values usually appeared in May through June; August also showed frequent extremes and outliers. Median concentrations of all parameters in all groups were also typically highest in May. May's variability and extreme values are likely the influence of spring freshet when more sediments and organics are disturbed within or contributed to the watercourses.

While general inferences can be made, at this time no conclusive spatial or temporal trends can be determined with the limited data. The data are temporally limited between Pre-Construction and Construction phases, and among periods. Only four years of Pre-Construction and four years of Construction data are available and the number of sample points within each period is also limited and inconsistent (e.g., October may have 12 Construction sample points while July has none). Although the Pre-Construction dataset cannot be augmented, as future sampling occurs, the Construction dataset will become more robust.

5.4 Quality Assurance and Quality Control

The QA/QC programs for water and sediment quality sampling are implemented to assess and/or quantify field, laboratory and data reduction quality.

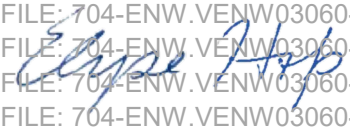
All elevations of field blank parameters above the RDL are likely attributed to residual water left in the sample tubing between samples. Sample tubing is rinsed for a minimum of 15 minutes prior to sampling and other field equipment (e.g., grab sampler) is triple rinsed between samples. The limited elevations do not indicate major error.

In general, the QA/QC program confirmed that most blank and duplicate parameter concentrations are within acceptable quality ranges, therefore the overall analytical program is considered to accurately characterize water and sediment quality conditions at the sample stations.

6.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Saulteau EBA Environmental Services Joint Venture



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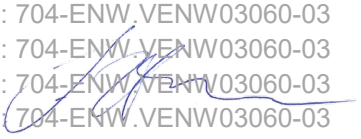

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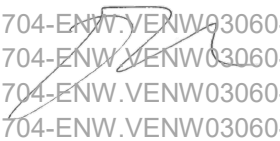

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Table 1: Summary of Surface Water Quality Parameters Compared to BC Approved Water Quality Guidelines

Parameters Represented within the BC Approved Water Q	Unit	Reported Detection Limit (RDL)	BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Common Sources of Parameter
Physical Parameters and Field Measurements				
Temperature	°C	-	15	The temperature guideline is designed to protect aquatic life in fresh, estuarine and coastal marine waters from excessive temperature fluctuations that are influenced by anthropogenic activities during sensitive periods. Given the large variation in water temperatures throughout British Columbia due both to the geographical range of the province as well as the large differences in elevation, ambient temperatures are factored into the guidelines so that they adhere closely to the natural temperature regime to which sensitive organisms have adapted through evolutionary processes (BC MOE 2019). Deviation from the guideline value indicates variance of water temperatures outside of normal environmental conditions; natural variance outside of the normal range due to seasonal ambient temperature extremes may cause water temperatures to exceed guidelines and is reported accordingly.
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 #1	Oxygen is the single most important component of surface water for self-purification processes and the maintenance of aquatic organisms which utilize aerobic respiration. The guideline value presented focuses on the effects of minimum oxygen levels on aquatic life. Dissolved oxygen is not a known concern for other water uses other than for some industries, where corrosion can be a concern (ESRD 2018).
Hardness as CaCO3	mg/L	0.5		The hardness of water is generally due to the presence of calcium and magnesium in the water; the main natural sources of hardness in water are sedimentary rocks and runoff from soils (Health Canada 1979a). The BC AWQG established for several water quality parameters, such as total copper, lead and zinc are hardness dependent. The toxicity of metals such as copper, lead and zinc can be reduced as hardness increases (BC MELP 1998). Water hardness varies from soft to hard water conditions based on the following scale: very soft water(0 - 30); soft to moderately soft (31 - 75 mg/L); moderately soft/hard to hard (76 - 180 mg/L); very hard (181 - 250 mg/L) (ESRD, 2014).
pH	pH Units	-	6.5-9.0	The pH of water is determined by the geology of the watershed and is influenced by the seasonal and daily variations in photosynthesis, respiration and decomposition (Sanderson et al, 2012). pH is an important water quality parameter as it affects the solubility and bioavailability of some nutrients and metals. For example, heavy metals tend to be more toxic in water with lower pH because they are more soluble (Michaud 1991 in Sanderson et al 2012, page 92). Laboratory analyzed pH is considered secondary to field measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratory analyzed pH values.
Anions and Nutrients				
Ammonia as N	mg/L	0.005	See narrative #2	Naturally occurring; released from agricultural or industrial wastes; added as part of chloramination for drinking water disinfection (Health Canada 2017)
Chloride	mg/L	0.5	600	Naturally occurring (seawater intrusion); dissolved salt deposits, highway salt, industrial effluents, oil well operations, sewage, irrigation drainage, refuse leachates (Health Canada 2017).
Fluoride	mg/L	0.02	See equation #3	Naturally occurring (rock and soil erosion); may be added drinking water sources to promote dental health and subsequently present within anthropogenic effluents discharged into surface waters (Health Canada 2017).
Nitrate (as N)	mg/L	0.005	32.8	Naturally occurring; leaching or runoff from agricultural fertilizer use, manure and domestic sewage; may be produced from excess ammonia or nitirification in the distribution system (Health Canada 2017).
Nitrite (as N)	mg/L	0.001	0.06-0.60 #4	Naturally occurring; leaching or runoff from agricultural fertilizer use, manure and domestic sewage; may be produced from excess ammonia or nitirification in the distribution system (Health Canada 2017).
Total Metals				
Arsenic	mg/L	0.0005	0.005	Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land (WHO 2016). It Arsenic occurs naturally as a result of weathering of rock and soil. Levels of arsenic in natural source waters ranges between 2 and 50 µg/L (CCME 2001b). Arsenic is highly toxic in its inorganic form and long-term exposure can cause considerable health issues in humans.
Cobalt	mg/L	0.0003	0.11	
Copper	mg/L	0.001	See equation #5	Copper is a natural constituent of most rock types, with igneous rock containing the highest concentrations, followed by sedimentary rocks such as shale, sandstone and limestone (BC MOEAP 1987b). Bertine and Goldberg (1971, in BC MOEAP 1987b, page 6) estimated that 40 to 67% of total copper inputs are the result of natural weathering. Copper is acutely toxic to most forms of aquatic life at relatively low concentrations but is generally found in freshwater at trace concentrations ranging from 1- to 10 µg/L (BC MELP 1998), but can be as high as 50 µg/L (CCREM 1987). The toxicity of copper is highly influenced by water hardness, increasing with decreased hardness. Guidelines for copper are derived through the BC Biotic Ligand Model (BLM). Acute dissolved copper guideline values for each sample location are calculated using the simplified BC BLM model.
Iron	mg/L	0.03	1	Iron is a common element and is occurs naturally through weathering of sulphide ores and leaching of sandstones (CCREM 1987). Iron can be a significant constituent of soils, especially clays (Phippen et al 2008). Anthropogenic sources are often related to mining. It is a requirement for all lifeforms but can be toxic at high concentrations. The concentrations of iron in Canadian surface waters are generally below 10 mg/L (Health Canada 1978). The BC AWQG for total iron is 1 mg/L, the Health Canada aesthetic objective for iron in drinking water is ≤ 0.3 mg/L (Health Canada 1978).
Lead	mg/L	0.0005	See equation #6	Lead has been observed in natural waters ranging from trace levels up to 40 µg/L, in both the soluble and particulate forms (McNeely et al. 1979 in Sanderson et al 2012, page 174), and in regions with sulphide ores in the underlying geology, concentrations can reach 0.8 mg/L (BC MELP 1998). The toxicity of lead is dependent on the hardness, pH, alkalinity, and dissolved oxygen content of the water; toxicity increases as hardness decreases (CCREM 1987). The BC AWQG for total lead is hardness dependent (calculated as 3 µg/L at H<8 mg/L, or calculated as e(1.273*ln(H)-1.460) when H>8 mg/L).
Manganese	mg/L	0.0001	See equation #7	Naturally occurring (erosion and weathering of rocks and minerals; Health Canada 2017).
Molybdenum	mg/L	0.001	2	Molybdenum occurs in nature as a chemical combination with other elements (predomnately in porphyry copper ore deposits of molybdenite mined from central BC). Drainage from molybdenum-bearing mineral deposits and molybdenum mines is the only known source of molybdenum discharged to surface waters in BC (BC MOE 2019).
Selenium	mg/L	0.00005	0.002	Selenium occurs naturally in sedimentary rocks, shales, coal and phosphate deposits and soils and generally occurs together with sulfides of metals such as copper, zinc and lead (US EPA 2016). Selenium is bioaccumulative and can be toxic to aquatic life. Surface waters in most areas contain less than 1.0 µg/L (Lakin and Davidson 1967 in CCREM 1987 page 412). Concentrations of selenium in central Canadian waters typically range from 0.1 to 4 µg/L (CCREM 1987).
Silver	mg/L	0.00002	0.0001 or 0.003 #8	Naturally occurring (erosion and weathering of rocks and soils; Health Canada 2017).
Zinc	mg/L	0.005	See equation #9	Although relatively non-toxic to terrestrial organisms, zinc can be both acutely and chronically toxic to aquatic organisms (MELP 1998). Several factors such as water hardness, salinity, temperature, and the presence of other contaminants influence zinc toxicity in aquatic environments (BC MOE 1999). Its toxicity decreases with increasing hardness, increases with increasing temperature, and increases with decreasing dissolved oxygen (BC MELP 1998). Natural concentrations range from 1 to 96 µg/L (0.001 to 0.0096 mg/L), but do not typically exceed 40 µg/L (0.04 mg/L) in river water (Environment Canada 1984 in Health Canada 1987, page 2). In certain waters, such as in mining areas or acidic waters, concentrations 10- to 1000 times greater can be found (CCREM 1987).
Dissolved Metals				
Aluminum (Filtered)	mg/L	0.005	0.1 #10	Aluminum is generally found in concentrations of less than 1000 µg/L (BC MELP 1998). The dissolved form of aluminum is more toxic than the particulate form, with the greatest toxicity occurring in waters with pH less than 6 (CCREM 1987). A large fraction of total aluminum may not be bioavailable so toxicity may be overestimated, especially in highly turbid water (BC MOEAP 1988).
Cadmium (Filtered)	mg/L	0.000005	See equation #11	Cadmium, which has been shown to bioaccumulate, is highly toxic in all its forms, though dissolved cadmium is more bioavailable. The toxicity of cadmium is highly influenced by water hardness; the toxicity increases with decreased water hardness (CCME 2014). Presence of other heavy metals like zinc and copper have has been shown to increase cadmium's toxicity (BC MELP 1998). Weathering of rock and forest fires are the most common natural pathways for cadmium to enter surface water therefore, cadmium may occur at higher concentrations naturally because of the underlying geology.
Iron (Filtered)	mg/L	0.03	0.35	Iron is a common element and is occurs naturally through weathering of sulphide ores and leaching of sandstones (CCREM 1987). Iron can be a significant constituent of soils, especially clays (Phippen et al 2008). Anthropogenic sources are often related to mining. It is a requirement for all lifeforms but can be toxic at high concentrations. The concentrations of iron in Canadian surface waters are generally below 10 mg/L (Health Canada 1978). The BC AWQG for total iron is 1 mg/L, the Health Canada aesthetic objective for iron in drinking water is ≤ 0.3 mg/L (Health Canada 1978).

NOTES:

BC MOE 2019	British Columbia Ministry of Environment (BC MOE). 2019. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.
H	Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required.
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement.
#2	Guideline for ammonia nitrogen (NH_3) varies with pH and temperature, and is derived from Table 26D of the BC MOE 2019 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0 degC.
#3	Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L.
#4	Guideline for nitrite varies with chloride concentrations.
#5	Guidelines for copper are derived through the BC Biotic Ligand Model (BLM). Acute dissolved copper guideline values for each sample location are calculated using the simplified BC BLM model.
#6	Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273*ln(H)-1.460)}]/1000$ when H=8-360 mg/L
#7	Guideline for manganese varies with H and is calculated in mg/L and based on equation: (0.01102*H)+0.54, when H =25-259 mg/L.
#8	Guideline for silver varies with H. Guideline is 0.0001 mg/L when H<100 mg/L or 0.003 mg/L when H>100 mg/L
#9	Guideline for zinc varies with H. Guideline is 0.033 mg/L when H is <90 mg/L. Calculated in mg/L and based on equation: [33+0.75*(H-90)]/1000, when H=90-500 mg/L.
#10	Guideline for aluminum varies with pH. Guideline is 0.1 mg/L if pH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$ and pH < 6.5.
#11	Guideline for cadmium varies with H and is calculated in mg/L and based on equation: $[e^{(1.03*ln(H)-5.274)}]/1000$, when H=7-455 mg/L.

Table 2: Summary of Sediment Quality Parameters Compared to BC Working Water Quality Guidelines

Parameter	Unit	Reported Detection Limit (RDL)	BC MOE 2017 (mg/kg in dry weight) Lower SWQG	BC MOE 2017 (mg/kg in dry weight) Upper SWQG	Common Sources of Parameter
Metals (Soil)					
Arsenic	mg/kg	0.1	5.9[#1]	17[#2]	Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land (WHO 2016). It Arsenic occurs naturally as a result of weathering of rock and soil. Arsenic is highly toxic in its inorganic form and long-term exposure can cause considerable health issues in humans.
Cadmium	mg/kg	0.02	0.6[#1]	3.5[#2]	Cadmium, which has been shown to bioaccumulate, is highly toxic in all its forms, though dissolved cadmium is more bioavailable. Presence of other heavy metals like zinc and copper have has been shown to increase cadmium's toxicity (BC MELP 1998). Weathering of rock and forest fires are the most common natural pathways for cadmium to enter surface water therefore sediments; cadmium may occur at higher concentrations naturally because of the underlying geology.
Chromium	mg/kg	0.5	37.3[#1]	90[#2]	Leaching from topsoil and rocks is the most important natural source of chromium entry into bodies of water and underlying sediments (Agency for Toxic Disease and Substance Registry 2008). However, more than 70% of chromium in the environment comes from anthropogenic sources, such as tanneries, electroplating, non-ferrous foundries, wood treatment facilities, urban storm water runoff, and discharges from thermal generating stations (Health Canada 2015; BC MELP 1998). Chromium is generally present at low concentrations in Canadian surface waters (Health Canada 1979b).
Copper	mg/kg	0.5	35.7[#1]	197[#2]	Copper is a natural constituent of most rock types, with igneous rock containing the highest concentrations, followed by sedimentary rocks such as shale, sandstone and limestone (BC MOEAP 1987b). Bertine and Goldberg (1971, in BC MOEAP 1987b, page 6) estimated that 40 to 67% of total copper inputs are the result of natural weathering. Copper is acutely toxic to most forms of aquatic life at relatively low concentrations (BC MELP 1998).
Iron	mg/kg	50	21,200 (about 2%)[#3]	43,766 (about 4%)[#3]	Iron is a common element and is occurs naturally through weathering of sulphide ores and leaching of sandstones (CCREM 1987). Iron can be a significant constituent of soils especially clays (Phippen et al 2008). Anthropogenic sources are often related to mining. It is a requirement for all lifeforms but can be toxic at high concentrations.
Lead	mg/kg	0.5	35[#1]	91.3[#2]	Lead has been observed in natural environments, occurring either naturally but is also present in older infrastructure (e.g. pipes, solder, brass fittings and lead service lines; Health Canada 2017).
Manganese	mg/kg	1	460[#3]	1100[#3]	Naturally occurring (erosion and weathering of rocks and minerals; Health Canada 2017).
Mercury	mg/kg	0.005	0.17[#1]	0.486[#2]	Mercury is found in the environment naturally from the weathering of rocks but atmospheric deposition is a major pathway to aquatic systems (Sanderson et al 2012).
Nickel	mg/kg	0.5	16[#3]	75[#3]	Nickel naturally occurs as a chemical combination with other elements (erosion and weathering of rocks and minerals), and is also widely used in mettalurgical industry practices (BC MOE 2017).
Silver	mg/kg	0.1	0.5[#4]	N/A[#4]	Naturally occurring (erosion and weathering of rocks and soils; Health Canada 2017).
Zinc	mg/kg	2	123[#1]	315[#2]	Although relatively non-toxic to terrestrial organisms, zinc can be both acutely and chronically toxic to aquatic organisms (BC MELP 1998). Several factors such as water hardness, salinity, temperature, and the presence of other contaminants influence zinc toxicity in aquatic environments (BC MOE 1999). Concentrations within areas affected by mining or acidic water, concentrations, increased concentrations are found (CCREM 1987).

NOTES:

BC MOE 2017	BC MOE. 2017. Working Water Quality Guidelines and Working Sediment Quality Guidelines for British Columbia. Water Protection and Sustainability Branch. British Columbia Ministry of Environment.
Lower SWQG	A concentration that will protect aquatic life from adverse effects of toxic substance in most situations (equivalent to CCME's Threshold Effect Level or Interim Sediment Quality Guidelines (TEL or ISQGs; CCME 2001))
Upper SWQG	A concentration that if exceeded will likely cause severe effects on aquatic life (equivalent to CCME's Probably Effect Level (PEL; CCME (2001)).
CCME 2001	Canadian Council of Ministers of the Environment [CCME]. 2001. Canadian sediment quality guidelines. Canadian Council of Ministers of the Environment, Winnipeg. Accessed on-line at http://ceqg-rcqe.ccme.ca/en/index.html#void
AET	Apparent Effects Threshold
BA	Background Approach
CoA	Co-Occurrence analysis
EqP	Equilibrium Partitioning
ISQG	Interim Sediment Quality Guideline
NSTPA	National Status and Trends Program Approach
PEL	Probable Effect Level
SLC	Screening Level Concentration
#1	Lower SWQG is based on ISQG
#2	Upper SWQG is based on PEL
#3	Effect levels based on SLC
#4	Based on Ontario sediment guideline

Table 3: Williston Reservoir Water Quality Depth Profile Summary

Field Parameter	Sample Depth	Secchi Depth	Total Depth	Temperature	Dissolved Oxygen	Specific Conductivity	Electrical Conductivity	Salinity	Total Dissolved Solids	pH	ORP	Turbidity
Units	**m**	**m**	**m**	**°C**	**mg/L**	**SPCµS/cm**	**µS/cm**	**SAL-ppt**	**mg/L**		**mV**	**NTU**
BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)		**-**		**15**	**Minimum 5 mg/L (All life stages other than buried embryo/alevin)**	**-**	**-**	**-**	**-**	**6.5-9.0**	**-**	**-**
Sample Date	**m**	**m**	**m**	**°C**	**mg/L**	**SPCµS/cm**	**µS/cm**	**SAL-ppt**	**mg/L**		**mV**	**NTU**
25-May-19	0.2	6.50	59	3.3	12.33	185.8	109.1	0.09	121.0	7.06	190.0	1.42
	0.5			3.1	12.35	186.1	108.3	0.09	121.0	7.57	181.0	1.33
	1.0			3.1	12.37	186.2	108.3	0.09	121.0	7.63	180.7	1.30
	1.5			3.0	12.38	186.2	108.1	0.09	121.0	7.67	179.2	1.32
	2.0			3.1	12.37	186.2	108.2	0.09	121.0	7.69	179.2	1.38
	2.5			3.0	12.37	186.3	108.1	0.09	121.0	7.68	180.5	1.45
	3.0			3.0	12.37	186.2	108.1	0.09	121.0	7.66	182.0	1.28
	3.5			3.0	12.37	186.2	108.1	0.09	121.0	7.66	183.2	1.36
	4.0			3.0	12.36	186.3	108.1	0.09	121.0	7.65	184.7	1.32
	4.5			3.0	12.37	186.3	108.1	0.09	121.0	7.65	185.3	1.34
	5.0			3.0	12.36	186.3	108.1	0.09	121.0	7.66	185.8	1.36
24-Jun-19	0.2	3.50	78	10.9	11.14	186.9	136.4	0.09	121.0	7.91	143.6	1.33
	0.5			10.9	11.15	187.0	136.5	0.09	122.0	7.88	144.2	1.36
	1.0			10.8	11.05	187.0	136.3	0.09	122.0	7.88	143.5	1.46
	1.5			10.8	11.18	187.0	136.3	0.09	122.0	7.88	142.9	1.44
	2.0			10.8	11.19	187.0	136.3	0.09	122.0	7.90	142.3	1.50
	2.5			10.8	11.20	187.1	136.3	0.09	122.0	7.91	142.0	1.47
	3.0			10.8	11.20	187.0	136.2	0.09	122.0	7.92	141.6	1.44
	3.5			10.8	11.20	187.0	136.2	0.09	122.0	7.93	141.3	1.46
	4.0			10.8	11.21	187.0	136.2	0.09	122.0	7.94	141.3	1.45
	4.5			10.8	11.26	187.1	135.3	0.09	122.0	7.94	141.2	1.47
	5.0			10.3	11.31	187.1	134.3	0.09	122.0	7.94	141.5	1.42
25-Jul-19	0.2	6.00	68	**16.4**	9.81	187.2	156.3	0.09	121.6	8.29	61.9	0.52
	0.5			**16.2**	9.82	187.0	155.7	0.09	121.6	8.29	63.1	0.55
	1.0			**15.7**	9.88	187.0	154.0	0.09	121.5	8.30	63.0	0.58
	1.5			**15.6**	9.89	187.0	153.6	0.09	121.5	8.30	63.2	0.63
	2.0			**15.6**	9.90	187.1	153.2	0.09	121.6	8.28	63.9	0.68
	2.5			**15.1**	9.99	187.1	150.8	0.09	121.6	8.27	64.1	0.60
	3.0			14.8	9.99	187.0	150.3	0.09	121.5	8.26	64.6	0.60
	3.5			14.6	10.01	186.9	149.8	0.09	121.5	8.26	64.7	0.58
	4.0			14.6	10.09	186.5	149.4	0.09	121.3	8.26	65.2	0.58
	4.5			14.6	10.13	186.5	149.5	0.09	121.3	8.26	65.2	0.62
	5.0			14.5	10.12	186.0	149.1	0.09	121.5	8.28	64.2	0.61
22-Aug-19	0.2	6.50	142	**15.0**	9.42	178.6	144.6	0.08	116.0	7.08	270.5	0.74
	0.5			**15.0**	9.39	178.6	144.6	0.08	116.0	7.15	274.6	0.72
	1.0			**15.0**	9.38	178.6	144.6	0.08	116.0	7.19	276.9	0.73
	1.5			**15.0**	9.38	178.6	144.6	0.08	116.0	7.23	280.6	0.72
	2.0			**15.0**	9.37	178.6	144.6	0.08	116.0	7.27	289.2	0.75
	2.5			**15.0**	9.36	178.6	144.5	0.08	116.0	7.29	290.9	0.73
	3.0			**15.0**	9.36	178.6	144.5	0.08	116.0	7.25	295.5	0.70
	3.5			**15.0**	9.36	178.6	144.5	0.08	116.0	7.30	294.8	0.74
	4.0			**15.0**	9.36	178.6	144.5	0.08	116.0	7.31	295.6	0.74
	4.5			**15.0**	9.35	178.6	144.6	0.08	116.0	7.29	298.7	0.72
	5.0			**15.0**	9.35	178.6	144.5	0.08	116.0	7.25	303.5	0.73
24-Sep-19	0.2	3.00	125	13.5	9.48	180.4	140.7	0.09	117.2	8.81	83.9	3.54
	0.5			13.5	9.48	180.4	140.7	0.09	117.3	8.81	83.2	3.51
	1.0			13.5	9.47	180.4	140.7	0.09	117.3	8.80	82.9	3.58
	1.5			13.5	9.47	180.4	140.7	0.09	117.2	8.80	82.8	3.34
	2.0			13.5	9.46	180.4	140.7	0.09	117.2	8.79	82.7	3.25
	2.5			13.5	9.46	180.3	140.7	0.09	117.2	8.79	82.6	3.27
	3.0			13.5	9.45	180.3	140.7	0.09	117.2	8.82	80.8	3.65
	3.5			13.5	9.45	180.4	140.7	0.09	117.2	8.82	80.8	3.30
	4.0			13.5	9.45	180.4	140.7	0.09	117.2	8.82	80.9	3.42
	4.5			13.5	9.44	180.4	140.7	0.09	117.2	8.82	81.0	3.49
	5.0			13.5	9.44	180.4	140.7	0.09	117.3	8.82	80.9	3.45
24-Oct-19	0.2	4.50	-	9.8	10.14	181.0	128.4	0.09	118.0	7.80	76.4	-0.01
	0.5			9.8	10.14	181.1	128.4	0.09	118.0	7.88	71.1	0.00
	1.0			9.8	10.15	181.0	128.4	0.09	118.0	7.89	68.4	-0.04
	1.5			9.8	10.14	181.0	128.5	0.09	118.0	7.88	67.8	0.02
	2.0			9.8	10.14	181.0	128.5	0.09	118.0	7.89	66.9	-0.01
	2.5			9.8	10.14	181.1	128.5	0.09	118.0	7.91	65.2	-0.03
	3.0			9.8	10.14	181.0	128.4	0.09	118.0	7.92	65.1	-0.01
	3.5			9.8	10.14	181.0	128.4	0.09	118.0	7.91	64.9	0.01
	4.0			9.8	10.13	181.0	128.4	0.09	118.0	7.90	65.6	-0.01
	4.5			9.8	10.13	181.0	128.4	0.09	118.0	7.94	63.6	0.07
	5.0			9.8	10.13	181.0	128.4	0.09	118.0	7.95	63.0	0.00

NOTES:

BC MOE 2018 British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.

- No applicable standard/guideline or analysis was not conducted.
< Concentration is less than the laboratory detection limit indicated.
Bold Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.

Table 4: Dinosaur Reservoir Water Quality Depth Profile Summary

Field Parameter	Sample Depth	Secchi Depth	Total Depth	Temperature	Dissolved Oxygen	Specific Conductivity	Electrical Conductivity	Salinity	Total Dissolved Solids	pH	ORP	Turbidity
Units	m	m	m	°C	mg/L	SPCµS/cm	µS/cm	SAL-ppt	mg/L		mV	NTU
BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)		-		15	Minimum 5 mg/L (All life stages other than buried embryo/alevin)	-	-	-	-	6.5-9.0	-	-
Sample Date	m	m	m	°C	mg/L	SPCµS/cm	µS/cm	SAL-ppt	mg/L		mV	NTU
25-May-19	0.2	2.50	19	6.1	12.19	186.1	117.8	0.09	121.0	7.32	252.1	3.1
	0.5			4.7	12.46	184.4	112.9	0.09	120.0	7.65	242.5	3.2
	1.0			4.8	12.47	184.3	112.9	0.09	120.0	7.79	238.8	3.1
	1.5			4.4	12.48	184.4	111.9	0.09	120.0	7.85	237.0	3.1
	2.0			4.3	12.49	184.3	111.3	0.09	120.0	7.86	236.9	3.0
	2.5			4.2	12.48	184.2	111.1	0.09	120.0	7.88	236.0	3.1
	3.0			4.2	12.48	184.3	111.0	0.09	120.0	7.89	235.5	3.3
	3.5			4.1	12.48	184.3	110.9	0.09	120.0	7.90	235.1	3.2
	4.0			4.1	12.47	184.3	110.8	0.09	120.0	7.89	235.4	3.2
	4.5			4.1	12.47	184.3	110.8	0.09	120.0	7.90	235.2	3.0
	5.0			4.1	12.47	184.4	110.7	0.09	120.0	7.89	235.6	3.0
24-Jun-19	0.2	4.00	73	12.0	11.07	188.6	141.8	0.09	122.0	7.94	165.5	0.78
	0.5			12.0	11.10	189.5	142.6	0.09	123.0	7.92	167.4	0.82
	1.0			12.1	11.09	189.5	142.9	0.09	123.0	7.92	167.8	0.78
	1.5			11.7	11.16	189.3	142.4	0.09	123.0	7.92	168..5	0.75
	2.0			11.3	11.26	189.6	140.2	0.09	123.0	7.95	168.6	0.78
	2.5			10.8	11.40	189.7	139.3	0.09	123.0	7.93	169.1	0.82
	3.0			10.7	11.45	190.2	138.4	0.09	124.0	7.96	168.0	0.87
	3.5			10.5	11.52	190.3	137.3	0.09	124.0	8.00	166.3	0.89
	4.0			9.3	11.68	189.8	134.3	0.09	124.0	8.04	164.3	1.00
	4.5			8.7	11.73	189.2	130.4	0.09	123.0	8.06	162.5	1.23
	5.0			8.5	11.71	189.2	129.5	0.09	123.0	8.05	163.5	1.26
25-Jul-19	0.2	6.00	38	**17.4**	9.66	191.5	163.7	0.09	124.5	8.29	112.4	0.48
	0.5			**17.3**	9.66	191.5	163.3	0.09	124.5	8.29	107.5	0.49
	1.0			**17.2**	9.67	191.6	163.0	0.09	124.6	8.29	102.1	0.52
	1.5			**17.1**	9.67	191.7	162.4	0.09	124.6	8.30	97.6	0.53
	2.0			**16.6**	9.78	191.6	160.5	0.09	124.5	8.28	95.8	0.51
	2.5			**16.2**	9.84	191.6	159.5	0.09	124.6	8.27	94.1	0.57
	3.0			**15.9**	9.98	192.0	155.5	0.09	124.6	8.26	92.0	0.75
	3.5			14.8	10.28	191.5	155.0	0.09	124.5	8.24	92.4	0.67
	4.0			12.2	10.63	190.5	143.5	0.09	123.8	8.17	92.2	0.84
	4.5			11.4	10.75	190.0	141.5	0.09	123.5	8.15	94.3	0.90
	5.0			11.3	10.76	190.2	140.6	0.09	123.7	8.14	95.3	0.93
22-Aug-19	0.2	1.50	-	10.8	10.60	183.3	133.8	0.09	119.0	**4.30**	447.5	6.25
	0.5			10.8	10.59	183.4	133.8	0.09	119.0	**4.75**	460.0	5.99
	1.0			10.9	10.55	183.5	134.1	0.09	119.0	**4.92**	419.8	5.93
	1.5			11.0	10.58	183.5	134.3	0.09	119.0	**4.96**	419.4	6.02
	2.0			11.0	10.57	184.1	134.8	0.09	120.0	**5.03**	418.9	6.29
	2.5			11.0	10.56	184.2	135.2	0.09	120.0	**5.16**	412.3	6.29
	3.0			11.0	10.56	184.1	134.9	0.09	120.0	**5.22**	411.6	6.68
	3.5			11.0	10.55	184.2	134.7	0.09	120.0	**5.18**	420.0	6.55
	4.0			10.9	10.56	184.0	134.5	0.09	120.0	**5.08**	422.0	6.31
	4.5			11.0	10.55	184.0	134.6	0.09	120.0	**5.02**	427.6	6.31
	5.0			10.9	10.55	184.2	134.6	0.09	120.0	**5.06**	427.5	6.36
24-Sep-19	0.2	6.00	42	10.3	10.37	184.6	132.7	0.09	120.0	8.68	76.0	1.42
	0.5			10.3	10.36	184.6	132.7	0.09	120.0	8.68	76.0	1.43
	1.0			10.3	10.35	184.6	132.7	0.09	120.0	8.68	76.0	1.38
	1.5			10.3	10.35	184.6	132.8	0.09	120.0	8.69	76.0	1.40
	2.0			10.3	10.34	184.6	132.7	0.09	119.0	8.69	76.1	1.55
	2.5			10.3	10.34	184.6	132.7	0.09	120.0	8.69	76.2	1.42
	3.0			10.3	10.34	184.6	132.7	0.09	120.0	8.73	73.9	1.44
	3.5			10.3	10.33	184.7	132.8	0.09	120.0	8.74	73.7	1.42
	4.0			10.3	10.33	184.9	132.7	0.09	120.0	8.74	74.0	1.48
	4.5			10.3	10.32	184.9	132.7	0.09	120.0	8.74	74.3	1.52
	5.0			10.3	10.32	184.9	132.7	0.09	120.0	8.74	74.8	1.38
24-Oct-19	0.2	4.50	-	9.1	10.50	182.4	127.1	0.09	119.0	7.68	81.6	0.23
	0.5			9.1	10.46	182.4	127.1	0.09	119.0	7.78	77.4	0.20
	1.0			9.1	10.46	182.4	127.1	0.09	119.0	7.80	45.0	0.21
	1.5			9.1	10.46	182.4	127.1	0.09	119.0	7.84	71.7	0.23
	2.0			9.1	10.45	182.4	127.1	0.09	119.0	7.86	70.7	0.27
	2.5			9.1	10.45	182.4	127.1	0.09	119.0	7.92	66.6	0.27
	3.0			9.1	10.45	182.4	127.1	0.09	119.0	7.93	66.3	0.27
	3.5			9.1	10.44	182.4	127.1	0.09	119.0	7.94	65.6	0.28
	4.0			9.1	10.44	182.5	127.1	0.09	119.0	7.95	65.3	0.23
	4.5			9.1	10.45	182.5	127.1	0.09	119.0	7.97	63.5	0.26
	5.0			9.1	10.44	182.4	127.1	0.09	119.0	7.97	64.1	0.27

NOTES:

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- No applicable standard/guideline or analysis was not conducted.
< Concentration is less than the laboratory detection limit indicated.
Bold Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.

Table 5: Summary of October 2019 Sediment Quality Results

Parameter	Unit	Reported Detection Limit (RDL)	BC MOE 2017 (mg/kg in dry weight) Lower SWQG	BC MOE 2017 (mg/kg in dry weight) Upper SWQG	WILLISTON (W1)	DINOSAUR (D1)	PEACE CANYON (PC1)	UPPER SITE C RESERVOIR (PR1)	MIDDLE SITE C RESERVOIR (PR2)	HALFWAY RIVER - DOWNSTREAM (HD)	LOWER SITE C RESERVOIR (PR3)	MOBERLY RIVER - DOWNSTREAM (MD)	PEACE AT PINE (PD1)	PINE RIVER (PINE)	PEACE AT BEATTON (PD2)	BEATTON RIVER (BEATTON)	PEACE AT KISKATINAW (PD3)	KISKATINAW RIVER (KR)	PEACE AT POUCE COUPE (PD4)	POUCE COUPE (POUCE)	PEACE AT MANY ISLANDS (PD5)
Matrix					soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil
Sample Date					10/24/2019	10/24/2019	10/24/2019	10/24/2019	10/25/2019	10/25/2019	10/22/2019	10/22/2019	10/22/2019	10/22/2019	10/23/2019	10/23/2019	10/23/2019	10/23/2019	10/23/2019	10/23/2019	10/26/2019
Laboratory Identification Number					L2372206-1	L2372206-2	L2372206-4	L2372206-5	L2372211-2	L2372211-1	L2369827-2	L2369827-1	L2369827-3	L2369827-4	L2370751-1	L2370751-2	L2370751-3	L2370751-4	L2370751-5	L2370751-6	L2372548-1
Field Measurements																					
Sample Depth (bottom)	m	-	-	-	0.94	1.00	0.40	1.00	1.37	0.64	0.76	0.30	0.90	0.79	0.88	0.45	1.03	0.45	0.54	0.30	0.60
Particle Size (Soil)																					
% Sand (0.125mm - 0.063mm)	%	1.0	-	-	24.6	5.5	7.1	3	5.3	5.5	23.9	2.7	21.2	22.6	28.9	14.3	23	13.8	32.2	3.7	20.4
% Sand (0.25mm - 0.125mm)	%	1.0	-	-	<1	4.9	13.3	9.9	31.1	45.3	4.4	3	13.8	7	25.6	3.1	8.3	36.7	21.1	3.5	4.2
% Sand (0.50mm - 0.25mm)	%	1.0	-	-	<1	5.9	11	17.7	21.5	24.7	<1	4.1	<1	<1	<1	<1	<1	20.7	<1	7.4	<1
% Clay (<4um)	%	1.0	-	-	6.3	5.9	1	1	3.5	3.1	7.5	1.5	8.8	10.1	4.6	14.4	9.3	6.1	6	1.9	13.7
% Gravel (>2mm)	%	1.0	-	-	<1	18.4	51.1	49.3	<1	8.5	7.5	72.3	<1	<1	<1	<1	<1	<1	<1	70.5	<1
% Sand (1.00mm - 0.50mm)	%	1.0	-	-	<1	10	2.8	9.3	22.4	2.9	<1	5.5	<1	<1	<1	<1	<1	<1	<1	2.7	<1
% Silt (0.0312mm - 0.004mm)	%	1.0	-	-	35.3	18.7	3.1	2	6.3	4.8	-	-	-	-	18.8	39.6	31.3	11.7	19	4.2	35.9
% Silt (0.063mm - 0.0312mm)	%	1.0	-	-	33.2	11.8	3.7	1.7	4.5	3.1	-	-	-	-	21.7	28.6	27.6	10.1	21.1	3.8	25.5
% Sand (2.00mm - 1.00mm)	%	1.0	-	-	<1	18.8	6.9	6.1	4.9	2.1	<1	6.3	<1	<1	<1	<1	<1	<1	<1	2.3	<1
Carbon																					
Total Organic Carbon (TOC)	%	0.05			1.14	1.59	0.93	0.98	1.18	0.58	1.95	0.93	1.62	1.67	-	-	-	-	-	-	1.47
Physical Tests (Soil)																					
pH	pH Units	0.1	-	-	8.25	7.98	8.59	8.52	8.37	8.31	7.92	8.28	8.14	8.22	8.3	7.71	8.29	8.61	8.27	8.06	8.04
Anions and Nutrients (Soil)																					
Nitrogen (Total)	%	0.02	-	-	0.035	0.087	0.046	0.047	0.065	0.047	0.106	0.059	0.089	0.1	0.052	0.078	0.068	0.04	0.066	0.04	0.097
Plant Available Nutrients (Soil)																					
Ammonium	mg/kg	1	-	-	1.1	2.1	<1	<1	1.1	1.1	15	2.2	10.9	4	2.7	2.2	1.8	1	1.8	1.1	4
Nitrate (as NO3-N)	mg/kg	2	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Nitrate and Nitrite (as N)	mg/kg	2	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Phosphate	mg/kg	2	-	-	<2	5.1	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Metals (Soil)																					
Aluminum	mg/kg	50	-	-	5970	5980	9540	8430	5790	4070	6380	6310	5590	6740	4520	7480	6340	4,300	5230	3820	9810
Antimony	mg/kg	0.1	-	-	0.75	0.76	0.53	0.55	0.54	0.61	0.78	0.47	0.63	0.61	0.55	0.7	0.6	0.65	0.62	0.57	0.74
Arsenic	mg/kg	0.1	5.9[#1]	17[#2]	6.24	8.12	6.2	6.09	6.85	7.94	8.12	7.72	7.18	7.34	6.31	9.26	7.05	8.18	6.85	11.8	9.37
Barium	mg/kg	0.5	-	-	243	539	218	161	210	366	423	227	330	372	318	489	393	249	334	296	451
Beryllium	mg/kg	0.1	-	-	0.26	0.36	0.3	0.38	0.27	0.33	0.39	0.32	0.33	0.4	0.3	0.5	0.42	0.36	0.39	0.74	0.56
Bismuth	mg/kg	0.2	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron - soluble	mg/kg	5	-	-	<5	5.1	<5	<5	<5	<5	6.3	<5	<5	<5	<5	5.2	5.6	<5	<5	<5	8.5
Cadmium	mg/kg	0.02	0.6[#1]	3.5[#2]	0.949	0.62	0.373	0.578	0.51	0.505	0.933	0.457	0.832	0.615	0.459	0.591	0.621	0.404	0.616	0.369	0.836
Calcium	mg/kg	50	-	-	56,800	22,400	26,500	20,600	20,200	18,600	23,200	9920	23,800	17,400	20,200	4920	20,800	15,100	26,300	17,200	22,400
Chromium	mg/kg	0.5	37.3[#1]	90[#2]	15.4	12.2	27.1	19.5	12.9	8.59	14	11.7	12.9	13	9.71	15.6	13.3	9.1	11.9	9.08	19.3
Cobalt	mg/kg	0.1	-	-	7.58	6.29	8.75	8.33	6.65	5.56	7.28	6.72	6.76	7.7	5.54	9.22	6.68	7.35	6.42	7.41	9.49
Copper	mg/kg	0.5	35.7[#1]	197[#2]	16.2	18.4	26.3	21.1	14.7	10.8	19.8	13	15.9	17.3	10.7	18.1	13.8	10.2	13	9.55	21.2
Iron	mg/kg	50	21,200 (about 2%)[#3]	43,766 (about 4%)[#3]	15,500	17,200	24,500	26,000	17,000	20,400	17,700	25,000	16,300	18,800	14,000	20,400	15,800	19,700	15,200	**56,700**	22,000
Lead	mg/kg	0.5	35[#1]	91.3[#2]	7.34	8.49	7.82	6.93	6.6	6.21	8.44	5.62	7.25	8.65	6.1	9.43	7.21	6.5	6.73	5.91	10.3
Lithium	mg/kg	2	-	-	8	8.9	15.8	12.8	6.8	5.3	7.5	7.5	6.9	9.3	7	10.7	8.9	6.2	7.7	6.4	13.7
Magnesium	mg/kg	20	-	-	14,800	7,870	10,100	9,060	6,370	4270	7790	4390	7950	6570	6810	3810	7930	4100	8160	4670	8730
Manganese	mg/kg	1	460[#3]	1100[#3]	395	205	378	445	309	204	249	277	225	256	216	322	236	346	245	639	369
Mercury	mg/kg	0.005	0.17[#1]	0.486[#2]	0.0416	0.0766	0.0258	0.0343	0.0267	0.0251	0.0052	<0.005	<0.005	0.0052	0.036	0.0769	0.0656	0.0304	0.0434	0.03	0.0659
Molybdenum	mg/kg	0.1	-	-	1.2	1.34	0.75	0.97	1.1	1.58	1.78	1.1	1.45	1.15	1.1	1.26	1.36	1.06	1.29	1.2	1.59
Nickel	mg/kg	0.5	16[#3]	75[#3]	24.7	21.1	28.6	28.5	19.7	17.6	24.7	24.3	21.9	25	17.9	26.2	20.8	21.2	20.2	22.4	30.6
Phosphorus	mg/kg	50	-	-	841	782	797	808	771	1070	1030	796	862	871	782	690	774	493	745	1210	922
Potassium	mg/kg	100	-	-	820	1110	860	810	730	840	1220	800	970	1130	790	1190	1140	630	920	620	1660
Selenium	mg/kg	0.2	-	-	0.3	1.01	0.34	0.35	0.46	0.57	1.12	0.34	0.7	0.66	0.44	0.65	0.59	0.5	0.52	0.49	0.85
Silver	mg/kg	0.1	0.5[#4]	N/A[#4]	0.13	0.25	0.14	0.13	0.11	0.11	0.23	0.11	0.17	0.19	0.12	0.2	0.15	<0.1	0.14	<0.1	0.23
Sodium	mg/kg	50	-	-	87	116	110	91	79	73	69	72	79	70	75	82	79	70	71	70	98
Strontium	mg/kg	0.50	-	-	106	65.6	75.7	63.2	59.6	61.7	69.8	31.2	63.2	50.4	55.1	34.6	57.9	37	61.2	41.3	63.4
Sulphur	mg/kg	1000			<1000	<1000	<1000	<1000	<1000	<1000	1200	<1000	<1000	<1000	<1000	1100	<1000	<1000	<1000	<1000	1100
Thallium	mg/kg	0.050	-	-	0.17	0.154	0.089	0.092	0.094	0.088	0.19	0.089	0.152	0.152	0.1	0.157	0.14	0.086	0.121	0.086	0.202
Tin	mg/kg	2.0	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Titanium	mg/kg	1.0	-	-	113	42.4	207	99.6	118	15.3	31.9	144	32.1	30	37	39	51.8	43.3	41.7	37.1	58.3
Tungsten	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Uranium	mg/kg	0.05	-	-	0.885	0.977	0.603	0.602	0.666	0.923	1.2	0.628	0.897	0.812	0.705	1.03	0.84	0.577	0.778	0.811	1.06
Vanadium	mg/kg	0.2	-	-	33.4	27	46.5	40.4	28.1	21.4	33	28.9	27.6	26.7	21.2	29.1	29.2	22.4	25.6	30.5	39.8
Zinc	mg/kg	2	123[#1]	315[#2]	66.3	81.6	89.4	84.4	61.6	73.2	86.2	65.4	75.8	86.1	63.7	101	76.4	63.4	69.7	85.1	107
Zirconium	mg/kg	1	-	-	2.1	2.3	2.1	1.2	2.4	1.8	2.1	2.3	1.9	1.8	1.8	3.2	2.4	2.5	1.9	2.3	3.2

NOTES:

BC MOE 2017	BC MOE. 2017. Working Water Quality Guidelines and Working Sediment Quality Guidelines for British Columbia. Water Protection and Sustainability Branch. British Columbia Ministry of Environment.
Lower SWQG	A concentration that will protect aquatic life from adverse effects of toxic substance in most situations (equivalent to CCME's Threshold Effect Level or Interim Sediment Quality Guidelines (TEL or ISQGs; CCME 2001))
Upper SWQG	A concentration that if exceeded will likely cause severe effects on aquatic life (equivalent to CCME's Probably Effect Level (PEL; CCME (2001)).
CCME 2001	Canadian Council of Ministers of the Environment (CCME). 2001. Canadian sediment quality guidelines. Canadian Council of Ministers of the Environment, Winnipeg. Accessed on-line at http://ceqg-rcqe.ccme.ca/en/index.html#void
AET	Apparent Effects Threshold
BA	Background Approach
CoA	Co-Occurrence analysis
EqP	Equilibrium Partitioning
ISQG	Interim Sediment Quality Guideline
NSTPA	National Status and Trends Program Approach
PEL	Probable Effect Level
SLC	Screening Level Concentration
#1	Lower SWQG is based on ISQG
#2	Upper SWQG is based on PEL
#3	Effect levels based on SLC
#4	Based on Ontario sediment guideline
<	Concentration is less than the laboratory detection limit indicated.
-	No applicable standard or guideline
Unshaded	Concentration < Lower SWQG: Rarely associated with adverse biological effects (BC MOE, 2017)
Shaded only	Concentration > Lower SWQG but < Upper SWQG are occasionally associated with adverse biological effects (BC MOE, 2017)
Shaded and Bolded	Concentrations > Upper SWQG are frequently associated with adverse biological effects (BC MOE, 2017)

Table 6: May 2019 Surface Water Quality Results Summary

				Williston and Dinosaur Reservoirs				Future Site C Reservoir						Downstream of Site C Reservoir							
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**Williston Shallow (W1-SHALLOW)**	**Williston Deep (W1-DEEP)**	**Dinosaur Reservoir Shallow (D1-SHALLOW)**	**Dinosaur Reservoir Deep (D1-DEEP)**	**Peace Canyon Dam (PC1)**	**Peace 1: Upper Site C Reservoir (PR1)**	**Peace 2: Middle Site C Reservoir (PR2)**	**Halfway River - Downstream (HD)**	**Peace 3: Lower Site C Reservoir (PR3)**	**Moberly River - Downstream (MD)**	**Peace 1: Peace at Pine (PD1)**	**Pine River (PINE)**	**Peace at Beatton (PD2)**	**Beatton River (BEA)**	**Peace at Kiskatinaw (PD3)**	**Kiskatinaw River (KR)**	**Peace at Pouce Coupe (PD4)**	**Pouce Coupe River (POUCE)**	**Peace at Many Islands (PD5)**
Sample Date				5/25/2019	5/25/2019	5/25/2019	5/25/2019	5/26/2019	5/26/2019	5/26/2019	5/26/2019	5/23/2019	5/23/2019	5/23/2019	5/23/2019	5/24/2019	5/24/2019	5/24/2019	5/24/2019	5/24/2019	5/24/2019	5/24/2019
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491		6207857	6229426	6231488	6231374	6230146	6226276	6223596		6220613					
GPS - Easting (10 UTM)				549540	549540	562028	562028		566122	594889	596649	628028	628620	640247	641710		663060					
Laboratory Identification Number				L2279324-1	L2279324-2	L2279324-3	L2279324-4	L2279325-3	L2279325-4	L2279325-2	L2279149-1	L2279149-2	L2279149-3	L2279149-4	L2279150-1	L2279150-2	L2279150-3	L2279150-4	L2279150-5	L2279150-6	L2279150-7	
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	
Field Measurements																						
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	2.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-		59.1	59.1	18.6	18.6	0.5	1.0	2.0	0.6	5.3	2.4	4.8	1.3	1.1	0.9	4.0	1.2	3.8	1.6	3.5
Temperature	°C	-	15	3.3	3.0	6.1	4.1	4.6	4.8	5.7	10.8	7.8	12.8	8.9	9.2	8.3	13.5	8.8	13.5	9.2	**15.1**	10.3
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 [#1]	12.33	12.36	12.19	12.47	12.60	12.95	12.60	10.74	11.82	10.09	11.33	11.00	11.32	9.72	11.24	10.06	11.17	9.80	11.03
Specific Conductivity (SPC)	SPCµS/cm	-		185.8	186.3	186.1	184.4	213.4	185.2	188.4	315.8	224.8	202.3	223.5	196.6	206.5	130.0	205.4	272.6	207.2	318.6	207.4
Electrical Conductivity (EC)	SPCµS/cm	-		109.1	108.1	117.8	110.7	128.7	113.7	119.0	229.6	150.7	155.2	154.6	137.3	140.7	101.3	141.7	212.6	144.7	258.3	149.1
Salinity	parts per trillion	-		0.09	0.09	0.09	0.09	0.10	0.09	0.09	0.15	0.11	0.10	0.11	0.09	0.10	0.06	0.10	0.13	0.10	0.15	0.10
pH	pH Units	-	6.5-9.0	7.06	7.66	7.32	7.89	6.69	7.74	7.96	8.13	7.93	7.91	7.66	7.76	7.78	7.35	7.91	8.25	8.00	7.98	7.99
Turbidity	nephelometric units	-		1.4	1.4	3.1	3.0	2.7	2.6	6.3	158.4	44.5	141.5	72.1	116.1	103.4	157.0	105.9	322.8	102.7	134.8	100.2
Physical Parameters																						
Colour	TCU	5		6.1	7	10	10.2	10	9.6	10.1	26.7	20.8	30.4	21.6	19.8	19.7	142	19.2	45	23.4	80.3	26.5
Electrical Conductivity (EC)	µS/cm	2		194	195	193	194	191	187	190	315	235	215	228	206	214	136	213	284	217	330	216
Hardness as CaCO3	mg/L	0.5		94.5	91	93.6	97.4	93.8	91.3	97.6	160	124	110	125	110	115	58.4	115	149	115	148	115
pH	pH Units	0.1	6.5-9.0	8.17	8.19	8.18	8.18	8.11	8.1	8.12	8.25	8.26	8.26	8.19	8.25	8.15	7.69	8.15	8.3	8.16	8.13	8.16
Total Suspended Solids (TSS)	mg/L	3		<3	<3	<3	<3	<3	<3	12.6	465	75.4	299	92.4	274	225	181	206	473	218	200	187
Total Dissolved Solids (TDS)	mg/L	1		103	102	103	105	103	101	107	188	138	123	135	116	126	99	127	182	126	221	131
Turbidity	NTU	0.1		0.98	1.01	3.17	3.53	2.72	2.35	11.1	193	67.4	219	79.1	179	152	237	149	554	159	198	135
Anions and Nutrients																						
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		86.2	87.8	86.8	87.7	86.2	84.2	88.1	149	107	108	108	104	109	42.6	110	159	109	106	106
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.8	<1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		86.2	87.8	86.8	87.7	86.2	84.2	88.1	149	107	108	108	104	109	42.6	110	161	109	106	106
Ammonia as N	mg/L	0.005	See narrative [#2]	<0.005	<0.005	<0.005	<0.005	<0.005	0.0052	<0.005	0.0162	0.0175	0.0135	0.0127	0.011	0.0095	0.0157	0.0102	0.04	0.0108	0.0463	0.0081
Bromide	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.57	<0.5	0.83	<0.5	3.63	<0.5
Fluoride	mg/L	0.02	See equation [#3]	0.033	0.039	0.042	0.043	0.044	0.047	0.046	0.099	0.064	0.079	0.065	0.055	0.057	0.074	0.056	0.078	0.058	0.102	0.058
Nitrate and Nitrite (as N)	mg/L	0.0051		0.0682	0.0682	0.0756	0.0764	0.0718	0.0714	0.0674	0.031	0.0567	0.104	0.0624	0.106	0.0921	<0.0051	0.0932	0.0509	0.0862	0.0549	0.083
Nitrate (as N)	mg/L	0.005	32.8	0.0682	0.0682	0.0756	0.0764	0.0718	0.0714	0.0674	0.031	0.0567	0.104	0.0624	0.106	0.0921	<0.005	0.0932	0.048	0.0862	0.0448	0.083
Nitrite (as N)	mg/L	0.001	0.06-0.60 [#4]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0029	<0.001	0.0101	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05		0.088	0.095	0.084	0.101	0.09	0.105	0.141	0.3	0.287	0.297	0.369	0.421	0.173	0.546	0.452	0.699	0.195	1.46	0.449
Nitrogen (Total)	mg/L	0.03		0.138	0.143	0.171	0.184	0.167	0.173	0.182	0.474	0.251	0.331	0.312	0.38	0.352	0.878	0.28	0.703	0.307	1.04	0.356
Orthophosphate (as P) (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	0.0018	0.0012	0.0022	<0.001	<0.001	<0.001	0.0013	<0.001	0.0035	0.0014
Phosphorus (Total Dissolved)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	0.0031	0.0022	<0.002	0.0063	0.004	0.0043	0.0378	0.0036	0.0034	0.0762	0.0041	0.0089	0.004	0.0165	0.0154
Phosphorus	mg/L	0.002		0.0024	0.0029	0.0045	0.0051	0.0046	0.0047	0.0133	0.26	0.0913	0.219	0.097	0.176	0.164	0.171	0.178	0.387	0.165	0.168	0.169
Sulphate	mg/L	0.3		15.1	14.9	14.3	14.2	14.9	14.9	15.5	33.1	20.9	8.94	19.6	8.69	12	21.6	11.8	10.6	13.1	58.9	14.5
Silica	mg/L	0.5		5.31	5.31	4.8	5.62	5.28	5.14	7.13	4.53	4.33	3.47	4.08	3.16	3.77	5.85	3.52	5.22	3.83	3.14	4.05
Anions Total	meq/L			2.04	2.07	2.04	2.06	2.04	2	2.09	3.67	2.59	2.35	2.57	2.27	2.43	1.32	2.45	3.46	2.46	3.45	2.43
Cations Total	meq/L			1.89	1.82	1.87	1.95	1.88	1.83	1.95	3.31	2.58	2.29	2.54	2.19	2.31	1.57	2.29	3.21	2.29	3.57	2.42
Ionic Balance	N/A			-	-	-	-	-	-	-	-	-	-	-	-	-	8.4	-	-	-	1.7	-
Chlorophyll A	ug/L	0.01		0.578	0.533	0.397	0.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic and Inorganic Carbon																						
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.52	2.39	2.89	2.89	2.79	2.76	3.06	6.25	5.41	8.05	5.58	4.5	4.78	24	4.9	13.2	5.7	22.3	6.14
Total Organic Carbon (TOC)	mg/L	0.5		2.46	2.22	2.78	2.91	2.77	2.9	3.24	7.48	6.2	8.88	5.36	4.72	6.93	22.8	7.95	16.1	6.69	27.2	8.93
Total Metals																						
Aluminum	mg/L	0.005		0.0247	0.0242	0.0519	0.0725	0.0666	0.0652	0.316	3.57	1.34	3.23	1.66	2.75	2.62	3.37	2.61	5.14	2.6	2.47	2.43
Antimony	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.0005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00113	0.00087	0.00137	0.00215	0.00205	0.00317	0.00305	0.00419	0.00216	0.00333	0.00205	
Barium	mg/L	0.02		0.032	0.032	0.04	0.039	0.039	0.04	0.048	0.253	0.095	0.28	0.116	0.173	0.168	0.149	0.16	0.297	0.162	0.126	0.147
Beryllium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00024	<0.0001	0.00023	0.0001	0.00016	0.00018	0.00027	0.00016	0.00041	0.00017	0.00019	0.00016
Bismuth	mg/L	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron - soluble	mg/L	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	mg/L	0.000005	See equation [#12]	0.0000083	0.0000099	0.0000101	0.0000088	0.0000121	0.0000101	0.0000103	0.0000198	0.0000189	0.0000117	0.0000691	0.0000121	0.0000128	0.0000637	0.0000126	0.0000104	0.0000135	0.0000102	0.0000327
Calcium	mg/L	0.1		27.6	25.5	26.8	28.1	26.7	26.1	27.7	42.4	34.5	29.8	35.4	31.7	33.3	15.5	32.7	41.7	32.4	40	33
Chromium	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	0.0003		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0003	<0.0003	0.00056	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Copper	mg/L	0.001	See BC BLM [#11]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0014	0.0017	<0.001	0.0046	<0.001	0.0026	<0.001	0.0029	<0.001
Iron	mg/L	0.03	0.35	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.046	**0.378**	<0.03	<0.03	**1.09**	<0.03	0.033	<0.03	0.139	0.204
Ferrous Iron	mg/L	0.02																				
Lead	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00073	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Lithium	mg/L	0.001		0.001	0.001	0.0013	0.0013	0.0013	0.0013	0.0015	0.0047	0.0027	0.0031	0.0029	0.0029	0.0027	0.0041	0.0028	0.0023	0.0027	0.0052	0.003
Magnesium	mg/L	0.1		6.24	6.64	6.49	6.6	6.57	6.34	6.88	13.2	9.25	8.68	8.94	7.41	7.82	4.78	7.97	10.9	8.22	11.6	7.94
Manganese	mg/L	0.0001		0.00158	0.0011	0.00168	0.00146	0.00193	0.00165	0.00148	0.0102	0.00394	0.00638	0.0163	0.00395	0.00354	0.0186	0.00368	0.00489	0.00323	0.00926	0.00912
Mercury	mg/L	0.0000005		<0.0000005	<0.0000005	0.0000063	0.0000064	0.0000066	0.0000067	0.0000073	0.0000127	0.0000133	0.0000162	0.0000432	0.0000157	0.0000128	0.0000136	0.0000121	0.0000198	0.0000139	0.0000262	0.0000261
Methyl Mercury (Filtered)	mg/L	0.00000002		<0.00000020	<0.00000020	<0.00000020	<0.00000020	<0.00000020	<0.00000020	<0.00000020	0.00000028	<0.00000080	0.00000064	0.00000048	<0.00000020	0.00000027	0.00000018	0.00000036	0.00000041	0.00000031	0.00000206	0.00000038
Molybdenum (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0028	0.0014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0019	0.0014	0.0017	0.0021	<0.001	0.0011	0.0049	0.0011	0.0018	0.0012	0.0038	0.0016
Phosphorus (filtered) (Filtered)	mg/l	0.3		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	3.7	<2
Potassium (Filtered)	mg/L	2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Selenium (Filtered)	mg/L	0.00005		0.000295	0.000234	0.000254	0.000299	0.000229	0.000264	0.000293	0.00134	0.000494	0.000228	0.000423	0.00039	0.000462	0.000256	0.000495	0.00024	0.000434	0.000298	0.000433
Silicon (Filtered)	mg/L	0.05		2.15	2.11	2.22	2.15	2.06	2.11	1.99	1.73	2.01	1.73	2.18	1.29	1.51	3.48	1.52	2.14	1.64	1.19	1.87
Silver (Filtered)	mg/L	0.00002		<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Sodium (Filtered)	mg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	2.1	2.4	<2	<2	<2	6.4	<2	5.2	<2	11.9	2.1
Strontium (Filtered)	mg/L	0.005		0.102	0.0992	0.095	0.0976	0.105	0.0947	0.105	0.208	0.142	0.0729	0.134	0.0946	0.103	0.0608	0.108	0.163	0.111	0.183	0.11
Thallium (Filtered)	mg/L	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Tin (Filtered)	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Titanium (Filtered)	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium (Filtered)	mg/L	0.0002		0.00046	0.00046	0.00043	0.00045	0.00048	0.00045	0.00047	0.00062	0.00048	0.00023	0.00049	0.00022	0.0003	0.00032	0.0003	0.0004	0.00033	0.00061	0.00035
Vanadium (Filtered)	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00098	<0.0005	<0.0005	0.00187	<0.0005	<0.0005	<0.0005	<0.0005	0.00067
Zinc (Filtered)	mg/L	0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0059	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES:

BC MOE 2019 — British Columbia Ministry of Environment (BC MOE). 2019. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.

H — Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required.

#1 — Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement.

#2 — Guideline for ammonia nitrogen (NH_3) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2019 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0 degC.

#3 — Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L.

#4 — Guideline for nitrite varies with chloride concentrations.

#5 — Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273*ln(H)-1.460)}]/1000$ when H=8-360 mg/L

#6 — Guideline for manganese varies with H and is calculated in mg/L and based on equation: (0.01102*H)+0.54, when H =25-259 mg/L.

#7 — Guideline for silver varies with H. Guideline is 0.0001 mg/L when H<100 mg/L or 0.003 mg/L when H>100 mg/L

#8 — Guideline for zinc varies with H. Guideline is 0.033 mg/L when H is <90 mg/L. Calculated in mg/L and based on equation: [33+0.75*(H-90)]/1000, when H=90-500 mg/L.

#9 — Guideline for aluminum varies with pH. Guideline is 0.1 mg/L if pH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.205*2.426(pH)+0.288K)}$ where K=[pH]^2 and pH < 6.5.

#10 — Guideline for cadmium varies with H and is calculated in mg/L and based on equation: $[e^{(1.137*ln(H)-4.274)}]/1000$, when H=7-455 mg/L.

#11 — Guidelines for copper are derived through the BC Biotic Ligand Model (BLM). Acute dissolved copper guideline values for each sample location are calculated using the simplified BC BLM model.

\- — No applicable guideline or analysis was not conducted.

< — Concentration is less than the laboratory detection limit indicated.

Bold — Bold and shaded indicates an exceedance of the applied guideline.

MPN — Most Probable Number

CFU — Colony Forming Units

Table 7: June 2019 Surface Water Quality Results Summary

				Dinosaur and Williston Reservoirs				Future Site C Reservoir						Downstream of Site C Reservoir							
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**Williston Shallow (W1-SHALLOW)**	**Williston Deep (W1-DEEP)**	**Dinosaur Reservoir Shallow (D1-SHALLOW)**	**Dinosaur Reservoir Deep (D1-DEEP)**	**Peace Canyon Dam (PC1)**	**Peace 1: Upper Site C Reservoir (PR1)**	**Peace 2: Middle Site C Reservoir (PR2)**	**Halfway River - Downstream (HD)**	**Peace 3: Lower Site C Reservoir (PR3)**	**Moberly River - Downstream (MD)**	**Peace 1: Peace at Pine (PD1)**	**Pine River (PINE)**	**Peace at Beatton (PD2)**	**Beatton River (BEA)**	**Peace at Kiskatinaw (PD3)**	**Kiskatinaw River (KR)**	**Peace at Pouce Coupe (PD4)**	**Pouce Coupe River (POUCE)**	**Peace at Many Islands (PD5)**
Sample Date				6/24/2019	6/24/2019	6/24/2019	6/24/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/23/2019	6/23/2019	6/23/2019	6/23/2019	6/22/2019	6/22/2019	6/22/2019	6/22/2019	6/22/2019	6/22/2019	6/22/2019
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491		6207857	6229426	6231488	6231374	6230146	6226276	6223596		6220613					
GPS - Easting (10 UTM)				549540	549540	562028	562028		566122	594889	596649	628028	628620	640247	641710		663060					
Laboratory Identification Number				L2297595-1	L2297595-2	L2297595-3	L2297595-4	L2298412-3	L2298412-4	L2298412-2	L2298412-1	L2297001-2	L2297001-1	L2297001-3	L2297001-4	L2297002-1	L2297002-2	L2297002-3	L2297002-4	L2297002-5	L2297002-6	L2297002-7
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water
Field Measurements																						
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-		78.0	78.0	73.2	73.2	0.5	0.5	1.1	0.8	3.8	0.5	4.2	0.7	3.3	0.4	2.3	0.5	2.7	0.3	2.7
Temperature	°C	-	15	10.9	10.3	12.0	8.5	**15.3**	8.2	8.7	12.2	11.7	**15.6**	12.0	12.9	11.1	**15.1**	11.2	14.7	11.8	**21.6**	12.6
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 [#1]	11.12	11.31	11.07	11.71	10.81	11.95	11.12	10.10	10.69	9.54	10.59	10.13	10.53	9.42	10.74	9.87	10.66	9.26	10.56
Specific Conductivity (SPC)	SPCµS/cm	-		186.9	187.1	188.6	189.2	347.1	190.0	199.3	368.3	235.6	202.4	235.9	238.4	232.1	240.3	233.0	345.2	235.9	498.1	233.7
Electrical Conductivity (EC)	SPCµS/cm	-		136.5	134.3	141.8	129.5	283.1	128.9	137.2	278.4	175.8	166.0	177.5	183.1	170.6	194.8	171.6	277.4	176.2	465.8	178.2
Salinity	parts per trillion	-		0.09	0.09	0.09	0.09	0.17	0.09	0.09	0.18	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.17	0.11	0.24	0.11
pH	pH Units	-	6.5-9.0	7.98	7.94	7.94	8.05	8.16	8.17	8.23	8.20	8.21	8.27	8.14	8.22	8.01	7.92	8.06	8.48	8.10	8.05	8.22
Turbidity	nephelometric units	-		1.3	1.4	0.8	1.3	2.1	1.6	19.4	116.8	7.6	21.7	9.1	16.4	12.9	33.1	13.1	94.0	15.9	23.2	13.8
Physical Parameters																						
Colour	TCU	5		6.3	6.2	5.3	6.8	7.8	5.7	6.1	8	6.7	26.2	7.7	7.3	6.6	81.9	6.5	31.6	9.6	50.3	10.1
Electrical Conductivity (EC)	µS/cm	2		193	193	195	197	249	196	205	376	233	198	234	234	239	248	239	353	242	497	240
pH	pH Units	0.1	6.5-9.0	8.26	8.28	8.28	8.29	8.32	8.26	8.27	8.46	8.3	8.25	8.3	8.32	8.38	8.21	8.39	8.56	8.4	8.46	8.39
Total Suspended Solids (TSS)	mg/L	3		<3	<3	<3	<3	<3	<3	20.2	268	12.3	37.3	14.9	25.9	27.9	41.5	25.1	92.7	27.7	20.1	19.7
Total Dissolved Solids (TDS)	mg/L	1		106	117	117	117	139	106	112	239	136	119	138	137	143	195	141	241	137	326	144
Turbidity	NTU	0.1		1.06	1.03	0.55	0.52	1.27	1.43	20.5	166	4.53	24.9	6.44	15.2	11.4	39.5	12.7	118	16.4	25.8	14.7
Anions and Nutrients																						
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		84.7	84.9	85	84.3	103	84.5	87.8	170	109	106	111	115	107	80.9	106	180	108	152	106
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	<1	<1	4.8	<1	<1	10.2	<1	<1	<1	2.4	5.8	<1	6.2	14.8	6.4	9.4	5.8
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		84.7	84.9	85	84.3	108	84.5	87.8	180	109	106	111	117	112	80.9	112	195	114	162	112
Ammonia as N	mg/L	0.005	See narrative [#2]	<0.005	<0.005	0.0115	<0.005	<0.005	<0.005	<0.005	0.0098	<0.005	0.0082	<0.005	0.0131	0.0051	0.0108	<0.005	0.0203	0.0052	0.024	<0.005
Bromide	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	5.02	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.58	<0.5	0.99	<0.5	0.58	<0.5	5.8	<0.5
Fluoride	mg/L	0.02	See equation [#3]	0.04	0.04	0.043	0.043	0.061	0.049	0.051	0.107	0.058	0.079	0.06	0.066	0.061	0.108	0.062	0.086	0.062	0.146	0.059
Nitrate and Nitrite (as N)	mg/L	0.0051		0.0562	0.0568	0.0442	0.0487	0.0595	0.0594	0.0562	<0.0051	0.0304	0.0262	0.0283	0.0257	0.0278	<0.0051	0.0275	0.0349	0.027	<0.0051	0.0241
Nitrate (as N)	mg/L	0.005	32.8	0.0562	0.0568	0.0442	0.0487	0.0595	0.0594	0.0562	<0.005	0.0304	0.0252	0.0283	0.0257	0.0278	<0.005	0.0275	0.0312	0.027	<0.005	0.0241
Nitrite (as N)	mg/L	0.001	0.06-0.60 [#4]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0011	<0.001	<0.001	<0.001	<0.001	<0.001	0.0037	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05		0.141	0.141	0.162	0.105	0.096	0.064	0.149	0.453	0.089	0.235	0.154	0.156	0.133	0.683	0.129	0.578	0.17	0.936	0.143
Nitrogen (Total)	mg/L	0.03		0.218	0.168	0.215	0.198	0.186	0.172	0.172	0.237	0.145	0.361	0.199	0.133	0.219	0.709	0.214	0.609	0.23	0.921	0.139
Orthophosphate (as P) (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0057	<0.001	<0.001	<0.001	0.0012	<0.001	0.0015	<0.001	0.0029	<0.001	<0.001	<0.001
Phosphorus (Total Dissolved)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0047	0.0055	<0.002	0.0053	<0.002	0.0022	0.0029	0.0164	0.0021	0.0083	0.0022	0.0124	<0.002
Phosphorus	mg/L	0.002		0.009	0.0037	0.0099	0.0144	0.0032	0.0034	0.0291	0.239	0.0147	0.0465	0.0151	0.025	0.0251	0.0668	0.022	0.122	0.0281	0.0469	0.0205
Sulphate	mg/L	0.3		15.1	15.1	15.2	15.4	17.3	15.6	17.2	45.1	22.1	8.8	21.5	14.2	17.6	41.1	18.6	11.7	18.3	96	19
Silica	mg/L	0.5		4.54	4.42	4.45	4.43	4.73	4.3	4.35	3.47	4.07	3.14	3.9	2.65	3.33	4.57	3.45	4.91	3.5	1.11	3.49
Chlorophyll A	µg/L	0.01		1.12	1.18	1.41	2.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic and Inorganic Carbon																						
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.55	2.6	1.93	2.32	4.65	2.4	2.9	3.08	2.44	6.68	2.79	2.23	2.61	18.3	2.89	11.3	3.07	19.4	3.01
Total Organic Carbon (TOC)	mg/L	0.5		2.97	2.49	2.97	2.66	3.36	2.39	2.78	6.09	2.66	7.6	2.93	2.72	2.81	19.4	2.98	13.3	3.36	20.8	3.5

NOTES:

BC MOE 2019	British Columbia Ministry of Environment (BC MOE). 2019. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.
H	Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required.
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement.
#2	Guideline for ammonia nitrogen (NH_3) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2019 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0 degC.
#3	Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L.
#4	Guideline for nitrite varies with chloride concentrations.
#5	Guideline for copper varies with H and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L.
#6	Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273*ln(H)-1.460)}]$/1000 when H=8-360 mg/L
#7	Guideline for manganese varies with H and is calculated in mg/L and based on equation: (0.01102*H)+0.54, when H =25-259 mg/L.
#8	Guideline for silver varies with H. Guideline is 0.0001 mg/L when H<100 mg/L or 0.003 mg/L when H>100 mg/L
#9	Guideline for zinc varies with H. Guideline is 0.033 mg/L when H is <90 mg/L. Calculated in mg/L and based on equation: [33+0.75*(H-90)]/1000, when H=90-500 mg/L.
#10	Guideline for aluminum varies with pH. Guideline is 0.1 mg/L if pH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$ and pH < 6.5.
#11	Guideline for cadmium varies with H and is calculated in mg/L and based on equation: $[e^{(1.03*ln(H)-5.274)}]$/1000, when H=7-455 mg/L.
-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of the applied guideline.
MPN	Most Probable Number
CFU	Colony Forming Units

Table 8: July 2019 Surface Water Quality Results Summary

				Williston and Dinosaur Reservoirs					Future Site C Reservoir					Downstream of Site C Reservoir							
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**Williston Shallow (W1-SHALLOW)**	**Williston Deep (W1-DEEP)**	**Dinosaur Reservoir Shallow (D1-SHALLOW)**	**Dinosaur Reservoir Deep (D1-DEEP)**	**Peace Canyon Dam (PC1)**	**Peace 1: Upper Site C Reservoir (PR1)**	**Peace 2: Middle Site C Reservoir (PR2)**	**Halfway River - Downstream (HD)**	**Peace 3: Lower Site C Reservoir (PR3)**	**Moberly River - Downstream (MD)**	**Peace 1: Peace at Pine (PD1)**	**Pine River (PINE)**	**Peace at Beatton (PD2)**	**Beatton River (BEA)**	**Peace at Kiskatinaw (PD3)**	**Kiskatinaw River (KR)**	**Peace at Pouce Coupe (PD4)**	**Pouce Coupe River (POUCE)**	**Peace at Many Islands (PD5)**
Sample Date				7/25/2019	7/25/2019	7/25/2019	7/25/2019	7/25/2019	7/26/2019	7/26/2019	7/26/2019	7/23/2019	7/23/2019	7/23/2019	7/23/2019	7/24/2019	7/24/2019	7/24/2019	7/24/2019	7/24/2019	7/24/2019	7/24/2019
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491		6207857	6229426	6231488	6231374	6230146	6226276	6223596		6220613					
GPS - Easting (10 UTM)				549540	549540	562028	562028		566122	594889	596649	628028	628620	640247	641710		663060					
Laboratory Identification Number				L2318093-1	L2318093-2	L2318093-3	L2318093-4	L2318093-6	L2318094-3	L2318094-2	L2318094-1	L2315473-2	L2315473-1	L2315473-3	L2315473-4	L2317044-1	L2317044-2	L2317044-3	L2317044-4	L2317044-5	L2317044-6	L2317044-7
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water
Field Measurements																						
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-		68.0	68.0	38.1	38.1	0.5	1.0	1.1	0.8	3.1	0.9	6.1	0.5	3.0	1.0	2.7	0.8	5.9	0.3	2.8
Temperature	°C	-	15	**16.4**	14.5	**17.4**	11.3	**16.2**	9.9	10.6	**15.7**	12.8	**18.8**	14.0	**19.0**	14.9	**20.2**	**15.3**	**20.5**	**15.9**	**19.3**	**16.9**
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 [#1]	9.81	10.12	9.66	10.76	10.20	11.04	10.89	9.34	10.43	8.86	10.25	9.26	9.75	8.27	9.61	8.53	9.44	8.71	9.25
Specific Conductivity (SPC)	SPCµS/cm	-		187.2	186.0	191.5	190.2	216.3	190.5	194.1	319.4	22.7	227.1	225.0	257.3	244.6	156.9	240.8	355.9	239.1	549.0	234.2
Electrical Conductivity (EC)	SPCµS/cm	-		156.3	149.1	163.7	140.6	180.2	135.7	140.8	262.8	170.7	200.3	177.9	228.1	197.5	142.5	169.2	325.7	197.7	489.3	198.3
Salinity	parts per trillion	-		0.09	0.09	0.09	0.09	0.10	0.09	0.09	0.15	0.11	0.11	0.11	0.12	0.12	0.07	0.11	0.17	0.11	0.27	0.11
pH	pH Units	-	6.5-9.0	8.29	8.28	8.29	8.14	7.98	8.05	8.15	8.27	8.02	8.33	8.13	8.29	8.21	7.84	8.23	8.59	8.29	8.46	8.26
Turbidity	nephelometric units	-		0.5	0.6	0.5	0.9	19.6	0.9	5.3	249.1	21.9	15.4	28.4	13.7	27.9	373.4	41.2	105.0	54.8	22.5	61.1
Physical Parameters																						
Colour	TCU	5		6.7	<5	7.3	6.6	5.6	5.7	5.7	56.9	10.2	18.5	11.5	8.3	12.4	163	18.8	28.6	20.3	46	23.9
Electrical Conductivity (EC)	µS/cm	2		185	183	186	186	187	188	190	307	213	206	216	245	243	154	234	345	232	522	227
pH	pH Units	0.1	6.5-9.0	8.21	8.21	8.22	8.2	8.2	8.21	8.23	8.27	8.22	8.27	8.25	8.36	8.33	7.83	8.32	8.56	8.25	8.43	8.25
Total Suspended Solids (TSS)	mg/L	3		<3	<3	<3	<3	<3	<3	3.2	530	51.5	12.7	47.1	18.1	86.2	552	82	169	72.6	20	93.4
Total Dissolved Solids (TDS)	mg/L	1		114	114	115	118	116	119	121	276	157	159	155	158	176	276	185	288	186	408	185
Turbidity	NTU	0.1		0.76	0.97	0.77	1.02	0.66	0.79	1.9	416	22.1	9.28	26.5	9.95	27.4	247	47.3	158	64.1	28.9	68.2
Anions and Nutrients																						
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		81.8	80.8	83.1	82.8	83.2	85.1	85.8	134	104	113	102	120	111	49.8	107	184	112	157	108
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2.4	2	<1	1.8	10.6	<1	4.6	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		81.8	80.8	83.1	82.8	83.2	85.1	85.8	134	104	113	102	123	113	49.8	109	194	112	162	108
Ammonia as N	mg/L	0.005	See narrative [#2]	0.0052	0.0087	0.0072	0.0064	0.005	0.0059	0.0072	0.0402	<0.005	<0.005	0.0066	<0.005	<0.005	0.0241	0.0163	0.0141	0.0116	0.0158	0.0113
Bromide	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.56	<0.5	<0.5	<0.5	0.64	<0.5	7.21	0.51
Fluoride	mg/L	0.02	See equation [#3]	0.039	0.038	0.046	0.041	0.041	0.04	0.041	0.115	0.05	0.076	0.052	0.06	0.062	0.102	0.064	0.091	0.064	0.167	0.066
Nitrate and Nitrite (as N)	mg/L	0.0051		0.0441	0.045	0.0272	0.0545	0.0607	0.0589	0.0552	0.0095	0.0438	<0.0051	0.0379	0.0091	0.0317	<0.0051	0.0355	0.0188	0.0345	<0.0051	0.033
Nitrate (as N)	mg/L	0.005	32.8	0.0441	0.045	0.0272	0.0545	0.0607	0.0589	0.0552	0.0095	0.0438	<0.005	0.0379	0.0091	0.0302	<0.005	0.0355	0.0175	0.0345	<0.005	0.033
Nitrite (as N)	mg/L	0.001	0.06-0.60 [#4]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0015	<0.001	<0.001	0.0013	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05		0.105	0.154	0.127	0.091	0.077	0.128	0.138	1.12	0.134	0.188	0.156	0.131	0.201	1.32	0.299	0.437	0.26	0.778	0.283
Nitrogen (Total)	mg/L	0.03		0.164	0.152	0.15	0.232	0.157	0.188	0.161	0.646	0.197	0.224	0.235	0.131	0.221	1.16	0.264	0.456	0.278	0.814	0.282
Orthophosphate (as P) (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0058	<0.001	<0.001	<0.001	<0.001	<0.001	0.0045	0.0018	0.0017	<0.001	<0.001	<0.001
Phosphorus (Total Dissolved)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.246	0.002	0.0029	0.01	<0.002	0.0047	0.0161	0.0037	0.0457	0.0031	0.0103	0.0153
Phosphorus	mg/L	0.002		<0.002	0.0031	0.0031	0.0036	0.0029	0.0039	0.0068	0.53	0.0454	0.0182	0.0509	0.0196	0.0637	0.526	0.0754	0.132	0.0842	0.0402	0.098
Sulphate	mg/L	0.3		14.1	13.5	14.5	14.1	4.19	14.4	14.6	38.1	19.7	9.17	20.1	14.8	21	26.8	21.2	9.57	19.9	120	21.7
Silica	mg/L	0.5		3.89	3.76	3.92	3.99	14.3	4.16	3.96	4.18	3.97	2.49	3.8	2.27	3.41	5.22	3.56	4.48	3.41	0.65	3.45
Chlorophyll A	ug/L	0.01		1.26	1.06	0.814	0.714	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic and Inorganic Carbon																						
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.32	2.35	2.76	2.44	2.23	2.22	2.42	12.3	3.64	6.21	3.78	2.78	3.63	27.1	4.95	11.5	5.27	18.9	5.92
Total Organic Carbon (TOC)	mg/L	0.5		2.48	2.41	2.84	2.62	2.39	2.46	2.67	18.1	3.71	6.2	4.11	3.01	4.54	42.1	6.14	12.3	6.81	19.3	7.73

NOTES:

BC MOE 2019	British Columbia Ministry of Environment (BC MOE). 2019. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.
H	Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required.
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement.
#2	Guideline for ammonia nitrogen (NH_3) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2019 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0 degC.
#3	Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L.
#4	Guideline for nitrite varies with chloride concentrations.
-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of the applied guideline.
MPN	Most Probable Number
CFU	Colony Forming Units

Table 9: August 2019 Surface Water Quality Results Summary

				Williston and Dinosaur Reservoirs				Future Site C Reservoir						Downstream of Site C Reservoir								
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**Williston Shallow (W1-SHALLOW)**	**Williston Deep (W1-DEEP)**	**Dinosaur Reservoir Shallow (D1-SHALLOW)**	**Dinosaur Reservoir Deep (D1-DEEP)**	**Peace Canyon Dam (PC1)**	**Peace 1: Upper Site C Reservoir (PR1)**	**Peace 2: Middle Site C Reservoir (PR2)**	**Halfway River - Downstream (HD)**	**Peace 3: Lower Site C Reservoir (PR3)**	**Moberly River - Downstream (MD)**	**Peace 1: Peace at Pine (PD1)**	**Pine River (PINE)**	**Peace at Beatton (PD2)**	**Beatton River (BEA)**	**Peace at Kiskatinaw (PD3)**	**Kiskatinaw River (KR)**	**Peace at Pouce Coupe (PD4)**	**Pouce Coupe River (POUCE)**	**Peace at Many Islands (PD5)**
Sample Date				8/22/2019	8/22/2019	8/22/2019	8/22/2019	8/22/2019	8/23/2019	8/23/2019	8/23/2019	8/20/2019	8/20/2019	8/20/2019	8/20/2019	8/21/2019	8/21/2019	8/21/2019	8/21/2019	8/21/2019	8/21/2019	8/21/2019
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491		6207857	6229426	6231488	6231374	6230146	6226276	6223596		6220613					
GPS - Easting (10 UTM)				549540	549540	562028	562028		566122	594889	596649	628028	628620	640247	641710		663060					
Laboratory Identification Number				L2334419-1	L2334419-2	L2334419-3	L2334419-4	L2334419-6	L2334987-3	L2334987-2	L2334987-1	L2332416-2	L2332416-1	L2332416-3	L2332416-4	L2333813-1	L2333813-2	L2333813-3	L2333813-4	L2333813-5	L2333813-6	L2333813-7
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water
Field Measurements																						
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-		142.0	142.0	-	-	0.3	1.2	2.0	0.9	1.5	2.0	4.8	1.0	3.1	1.1	4.1	0.5	5.3	1.2	7.1
Temperature	°C	-	15	15.0	15.0	10.8	10.9	14.6	9.3	10.3	11.6	10.5	14.0	10.9	12.1	11.2	13.2	11.3	12.9	11.6	**16.2**	12.4
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 [#1]	9.42	9.35	10.60	10.55	10.43	11.06	10.65	10.04	10.42	9.73	10.40	10.19	10.19	9.63	10.21	9.99	10.09	9.22	9.99
Specific Conductivity (SPC)	SPCµS/cm	-		178.6	178.6	183.3	184.2	239.5	184.4	190.5	284.1	221.6	219.0	224.6	220.3	215.2	156.2	213.4	288.6	223.7	321.8	219.5
Electrical Conductivity (EC)	SPCµS/cm	-		144.6	144.5	133.8	134.6	192.3	129.3	136.9	214.2	160.3	173.2	164.0	165.9	158.5	121.0	157.4	221.9	166.4	268.0	166.6
Salinity	parts per trillion	-		0.08	0.08	0.09	0.09	0.11	0.09	0.09	0.14	0.11	0.10	0.11	0.11	0.10	0.07	0.10	0.14	0.11	0.15	0.10
pH	pH Units	-	6.5-9.0	7.08	7.25	**4.30**	**5.06**	**3.96**	6.80	6.86	6.82	**5.46**	**5.66**	**5.72**	**5.86**	6.56	**6.01**	**6.26**	6.50	**6.41**	6.50	**6.39**
Turbidity	nephelometric units	-		0.7	0.7	6.3	6.4	5.8	5.6	31.4	280.1	493.4	140.5	542.3	256.3	263.1	828.3	356.4	925.5	428.6	727.2	478.9
Physical Parameters																						
Colour	TCU	5		<5	5.2	9.1	9.3	12.6	8.6	15.8	77	63.3	75.1	58.2	40.1	44.9	211	60.7	70.2	60.5	76.3	68
Electrical Conductivity (EC)	µS/cm	2		185	185	191	190	256	190	196	297	226	219	222	220	223	165	221	304	234	336	231
pH	pH Units	0.1	6.5-9.0	8.19	8.18	8.17	8.17	8.25	8.21	8.2	8.27	8.04	8.18	8.06	8.18	8.14	7.68	8.07	8.26	8.06	8.03	8.05
Total Suspended Solids (TSS)	mg/L	3		<3	<3	4.4	<3	3.4	6.4	59.8	614	1150	180	1180	498	670	1980	956	2020	1020	1080	869
Total Dissolved Solids (TDS)	mg/L	1		119	118	123	122	161	120	125	298	283	210	285	209	235	271	253	385	300	353	258
Turbidity	NTU	0.1		0.83	0.86	6.98	7.25	5.25	5.15	34.5	419	1080	184	1030	327	374	2790	703	3170	808	1870	751
Anions and Nutrients																						
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		83.7	82.5	86.9	85.6	122	87.7	91.9	132	107	116	92.1	112	107	48.4	104	177	110	119	106
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		83.7	82.5	86.9	85.6	122	87.7	91.9	132	107	116	92.1	112	107	48.4	104	177	110	119	106
Ammonia as N	mg/L	0.005	See narrative [#2]	0.0056	<0.005	0.0157	<0.005	<0.005	<0.005	<0.005	0.0164	0.0377	-	0.0406	0.0123	0.0234	0.0769	0.0353	0.0969	0.038	0.0903	0.0332
Bromide	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	3.63	<0.5	<0.5	<0.5	0.53	0.92	0.64	0.62	0.55	1.17	0.52	1.09	0.62	6.49	0.65
Fluoride	mg/L	0.02	See equation [#3]	0.038	0.041	0.039	0.046	0.068	0.039	0.045	0.096	0.098	0.082	0.094	0.068	0.079	0.107	0.084	0.101	0.089	0.142	0.091
Nitrate and Nitrite (as N)	mg/L	0.0051		0.0432	0.042	0.0584	0.058	0.0454	0.062	0.0569	<0.0051	0.0443	0.0634	0.0465	0.0708	0.058	0.018	0.0533	0.0526	0.0544	0.089	0.0522
Nitrate (as N)	mg/L	0.005	32.8	0.0421	0.042	0.0584	0.058	0.0454	0.062	0.0569	<0.005	0.0432	0.0634	0.0449	0.0708	0.058	0.018	0.0533	0.0515	0.0544	0.0835	0.0522
Nitrite (as N)	mg/L	0.001	0.06-0.60 [#4]	0.0011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0011	<0.001	0.0016	<0.001	<0.001	<0.001	<0.001	0.0011	<0.001	0.0055	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05		0.084	0.117	0.095	0.083	0.089	0.12	0.174	0.35	0.412	1.65	0.353	0.277	0.374	1.09	0.507	0.699	0.412	0.949	0.615
Nitrogen (Total)	mg/L	0.03		0.138	0.148	0.183	0.171	0.212	0.178	0.239	0.409	0.412	1.24	0.401	0.303	0.357	0.827	0.428	0.709	0.421	0.926	0.492
Orthophosphate (as P) (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0045	0.0057	0.0014	0.0039	0.0016	0.0029	0.0043	0.0035	0.0037	0.0033	0.0071	0.0039
Phosphorus (Total Dissolved)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0023	0.01	0.282	0.0156	0.0123	0.0045	0.0051	0.195	0.0081	0.0103	0.0089	0.401	0.0096
Phosphorus	mg/L	0.002		0.0024	0.0032	0.008	0.0076	0.0073	0.0088	0.0586	0.6	0.906	0.159	0.89	0.41	0.869	1.48	0.817	1.7	0.839	12.8	0.7
Sulphate	mg/L	0.3		13.1	13.1	13.9	14	15	13.1	14	31.8	24.9	7.4	24	12.6	17.1	27.4	20	8.12	18.9	46.9	21
Silica	mg/L	0.5		3.99	4	4.29	4.5	5.41	4.34	4.53	4.3	4.57	3.94	4.63	3.34	3.91	6.07	4.23	4.91	4.18	4.24	4.18
Chlorophyl A	ug/L	0.01		1.17	1.22	0.821	1.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic and Inorganic Carbon																						
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.45	2.51	3	2.8	3.59	3.13	4.07	13.7	13	14.4	11.9	8.11	9.06	35.1	11.7	17.8	12.3	22.5	12.9
Total Organic Carbon (TOC)	mg/L	0.5		2.45	2.3	3.11	2.99	4.15	3.03	5.04	14.6	13.6	14.4	12.9	8.26	10.6	84.1	14.2	20.8	13.8	24.9	16

NOTES:

BC MOE 2019	British Columbia Ministry of Environment (BC MOE). 2019. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.
H	Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required.
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement.
#2	Guideline for ammonia nitrogen (NH_3) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2017 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0 degC.
#3	Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L.
#4	Guideline for nitrite varies with chloride concentrations.
-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of the applied guideline.
MPN	Most Probable Number
CFU	Colony Forming Units

Table 10: September 2019 Surface Water Quality Results Summary

				Williston and Dinosaur Reservoirs				Future Site C Reservoir						Downstream of Site C Reservoir							
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**Williston Shallow (W1-SHALLOW)**	**Williston Deep (W1-DEEP)**	**Dinosaur Reservoir Shallow (D1-SHALLOW)**	**Dinosaur Reservoir Deep (D1-DEEP)**	**Peace Canyon Dam (PC1)**	**Peace 1: Upper Site C Reservoir (PR1)**	**Peace 2: Middle Site C Reservoir (PR2)**	**Halfway River - Downstream (HD)**	**Peace 3: Lower Site C Reservoir (PR3)**	**Moberly River - Downstream (MD)**	**Peace 1: Peace at Pine (PD1)**	**Pine River (PINE)**	**Peace at Beatton (PD2)**	**Beatton River (BEA)**	**Peace at Kiskatinaw (PD3)**	**Kiskatinaw River (KR)**	**Peace at Pouce Coupe (PD4)**	**Pouce Coupe River (POUCE)**	**Peace at Many Islands (PD5)**
Sample Date				9/24/2019	9/24/2019	9/24/2019	9/24/2019	9/24/2019	9/25/2019	9/25/2019	9/25/2019	9/27/2019	9/27/2019	9/27/2019	9/27/2019	9/26/2019	9/26/2019	9/26/2019	9/26/2019	9/26/2019	9/26/2019	9/26/2019
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491		6207857	6229426	6231488	6231374	6230146	6226276	6223596		6220613					
GPS - Easting (10 UTM)				549540	549540	562028	562028		566122	594889	596649	628028	628620	640247	641710		663060					
Laboratory Identification Number				L2353324-1	L2353324-2	L2353324-3	L2353324-4	L2353324-6	L2354314-3	L2354314-2	L2354314-1	L2355994-2	L2355994-1	L2355994-3	L2355994-4	L2355246-1	L2355246-2	L2355246-3	L2355246-4	L2355246-5	L2355246-6	L2355246-7
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water
Field Measurements																						
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-		125.0	125.0	41.5	41.5	0.5	1.2	0.9	0.5	5.1	0.5	4.1	2.1	3.8	0.4	2.0	2.8	3.0	0.3	2.7
Temperature	°C	-	15	13.5	13.5	10.3	10.3	11.2	10.3	9.6	7.1	9.8	7.9	9.6	7.8	9.0	8.7	9.1	8.8	9.2	9.7	9.6
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 #1	9.48	9.44	10.37	10.32	10.54	10.84	10.73	11.43	10.74	11.21	10.85	11.24	10.83	10.79	10.79	10.97	10.78	11.17	10.81
Specific Conductivity (SPC)	SPCµS/cm	-		180.4	180.4	184.6	184.6	192.4	184.5	190.0	393.6	211.6	217.2	212.8	263.5	243.4	141.3	221.8	358.9	230.3	523.0	226.7
Electrical Conductivity (EC)	SPCµS/cm	-		190.7	140.7	132.7	132.7	141.7	132.6	134.2	258.7	149.9	146.1	150.1	177.0	169.2	97.4	154.6	247.8	160.9	370.1	160.0
Salinity	parts per trillion	-		0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.19	0.10	0.10	0.10	0.13	0.12	0.07	0.11	0.17	0.11	0.25	0.11
pH	pH Units	-	6.5-9.0	8.81	8.82	8.68	8.74	8.66	8.64	8.64	8.82	8.78	8.63	8.72	8.72	8.70	8.01	8.59	8.93	8.58	8.98	8.63
Turbidity	nephelometric units	-		3.5	3.5	1.4	1.4	1.4	1.6	5.0	21.1	6.6	12.2	7.9	15.6	7.9	49.7	14.8	61.4	13.6	12.3	12.9
Physical Parameters																						
Colour	TCU	5		5.8	5.3	6	7.8	7.2	6.3	6.8	23.9	6.4	22	7.7	8.3	8.8	266	51.3	34.5	35.3	47.1	30.6
Electrical Conductivity (EC)	µS/cm	2		179	179	189	186	193	189	194	399	215	215	207	258	250	143	218	342	224	510	223
pH	pH Units	0.1	6.5-9.0	8.14	8.16	8.21	8.12	8.16	8.25	8.26	8.48	8.28	8.32	8.29	8.33	8.3	7.61	8.22	8.43	8.09	8.33	8.07
Total Suspended Solids (TSS)	mg/L	3		4.6	3.2	<3	<3	<3	<3	6.2	33.2	10.9	14.7	10.7	22.7	11.4	66.6	19.2	51.2	17.4	8	14.8
Total Dissolved Solids (TDS)	mg/L	1		107	104	115	110	113	108	112	249	118	127	120	153	154	165	137	245	157	348	164
Turbidity	NTU	0.1		2.65	1.78	1.02	1.28	1.01	1.11	3.46	26.7	5.33	10.7	4.38	12.1	4.9	63.7	14.6	66	12	12.8	12.7
Anions and Nutrients																						
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		82.1	82.3	84.1	86.1	88.7	94.4	97.5	180	95.6	115	99.2	133	112	36.6	104	201	112	171	109
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	<1	<1	<1	<1	<1	13.6	<1	<1	<1	<1	4.6	<1	<1	7.4	<1	5.2	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		82.1	82.3	84.1	86.1	88.7	94.4	97.5	194	95.6	115	99.2	133	117	36.6	104	208	112	177	109
Ammonia as N	mg/L	0.005	See narrative #2	0.0055	0.0054	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0254	0.0062	0.0125	0.0063	0.0132	<0.005
Bromide	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	0.59	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.67	<0.5	0.64	<0.5	0.8	<0.5	7.1	0.51
Fluoride	mg/L	0.02	See equation #3	0.036	0.036	0.037	0.037	0.039	0.038	0.043	0.1	0.053	0.083	0.054	0.067	0.053	0.07	0.057	0.084	0.063	0.157	0.062
Nitrate and Nitrite (as N)	mg/L	0.0051		0.0468	0.0468	0.0611	0.061	0.0572	0.0571	0.056	0.0104	0.0408	<0.0051	0.0372	0.0263	0.0288	<0.0051	0.0332	0.0156	0.033	0.0093	0.0306
Nitrate (as N)	mg/L	0.005	32.8	0.0442	0.0444	0.06	0.06	0.0572	0.0571	0.056	0.0104	0.0408	<0.005	0.0372	0.0263	0.0288	<0.005	0.0332	0.0156	0.033	0.0093	0.0306
Nitrite (as N)	mg/L	0.001	0.06-0.60 #4	0.0026	0.0024	0.0011	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05		0.083	0.1	0.088	0.081	0.104	0.077	0.069	0.174	0.121	0.257	0.085	0.123	0.102	0.924	0.223	0.464	0.174	0.706	0.212
Nitrogen (Total)	mg/L	0.03		0.139	0.128	0.144	0.153	0.173	0.106	0.114	0.133	0.16	0.248	0.172	0.156	0.14	0.867	0.265	0.444	0.219	0.732	0.229
Orthophosphate (as P) (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0073	0.0023	<0.001	0.001	<0.001	<0.001
Phosphorus (Total Dissolved)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0035	<0.002	0.0035	<0.002	<0.002	<0.002	0.0308	0.0053	0.0048	0.0076	0.0078	0.0031
Phosphorus	mg/L	0.002		0.0072	0.005	0.0039	0.0035	0.004	0.004	0.0072	0.0368	0.0114	0.0172	0.0123	0.0216	0.0124	0.0955	0.0328	0.0705	0.0222	0.0319	0.0221
Sulphate	mg/L	0.3		13.7	13.7	14.4	14.4	14.4	14.4	15.1	50.1	18.8	9.56	18.6	18.5	19.8	29	21.7	10.3	21.8	105	20.9
Silica	mg/L	0.5		3.96	4.01	4.49	4.37	4.44	4.45	4.3	4.43	4.3	3.06	4.08	2.65	3.53	6.93	4.68	5.27	4.46	<0.5	4.06
Chlorophyll A	ug/L	0.01		1.37	1.41	1.01	0.911	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic and Inorganic Carbon																						
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.87	2.84	2.75	2.81	2.68	2.49	2.7	5.59	2.86	6.4	3.23	2.47	3.04	39.6	9.3	11.7	6.87	18.8	6.29
Total Organic Carbon (TOC)	mg/L	0.5		2.91	2.74	3.3	3.11	3.22	2.38	2.63	5.4	2.98	6.85	2.96	3.29	3.13	44.6	9.89	13.5	7.26	19.8	6.9

NOTES:

BC MOE 2019	British Columbia Ministry of Environment (BC MOE). 2019. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.
H	Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required.
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement.
#2	Guideline for ammonia nitrogen (NH_3) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2019 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0 degC.
#3	Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L.
#4	Guideline for nitrite varies with chloride concentrations.
#5	Guideline for copper varies with H and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L.
#6	Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273*ln(H)-1.460)}]$/1000 when H=8-360 mg/L
#7	Guideline for manganese varies with H and is calculated in mg/L and based on equation: (0.01102*H)+0.54, when H =25-259 mg/L.
#8	Guideline for silver varies with H. Guideline is 0.0001 mg/L when H<100 mg/L or 0.003 mg/L when H>100 mg/L
#9	Guideline for zinc varies with H. Guideline is 0.033 mg/L when H is <90 mg/L. Calculated in mg/L and based on equation: [33+0.75*(H-90)]/1000, when H=90-500 mg/L.
#10	Guideline for aluminum varies with pH. Guideline is 0.1 mg/L if pH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$ and pH < 6.5.
#11	Guideline for cadmium varies with H and is calculated in mg/L and based on equation: $[e^{(1.03*ln(H)-5.274)}]$/1000, when H=7-455 mg/L.
-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of the applied guideline.
MPN	Most Probable Number
CFU	Colony Forming Units

Table 11: October 2019 Surface Water Quality Results Summary

				Williston and Dinosaur Reservoirs				Future Site C Reservoir						Downstream of Site C Reservoir								
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2019 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**Williston Shallow (W1-SHALLOW)**	**Williston Deep (W1-DEEP)**	**Dinosaur Reservoir Shallow (D1-SHALLOW)**	**Dinosaur Reservoir Deep (D1-DEEP)**	**Peace Canyon Dam (PC1)**	**Peace 1: Upper Site C Reservoir (PR1)**	**Peace 2: Middle Site C Reservoir (PR2)**	**Halfway River - Downstream (HD)**	**Peace 3: Lower Site C Reservoir (PR3)**	**Moberly River - Downstream (MD)**	**Peace 1: Peace at Pine (PD1)**	**Pine River (PINE)**	**Peace at Beatton (PD2)**	**Beatton River (BEA)**	**Peace at Kiskatinaw (PD3)**	**Kiskatinaw River (KR)**	**Peace at Pouce Coupe (PD4)**	**Pouce Coupe River (POUCE)**	**Peace at Many Islands (PD5)**
Sample Date				10/24/2019	10/24/2019	10/24/2019	10/24/2019	10/24/2019	10/24/2019	10/25/2019	10/25/2019	10/22/2019	10/22/2019	10/22/2019	10/22/2019	10/23/2019	10/23/2019	10/23/2019	10/23/2019	10/23/2019	10/23/2019	10/26/2019
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491		6207857	6229426	6231488	6231374	6230146	6226276	6223596		6220613					
GPS - Easting (10 UTM)				549540	549540	562028	562028		566122	594889	596649	628028	628620	640247	641710		663060					
Laboratory Identification Number				L2372209-1	L2372209-2	L2372209-3	L2372209-4	L2372209-6	L2372209-7	L2372212-2	L2372212-1	L2369826-2	L2369826-1	L2369826-3	L2369826-4	L2370749-1	L2370749-2	L2370749-3	L2370749-4	L2370749-5	L2370749-6	L2372547-1
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water
Field Measurements																						
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-		-	-	-	-	0.7	1.0	4.4	1.4	0.8	0.5	2.0	0.5	3.1	1.2	4.6	0.5	2.7	0.6	4.0
Temperature	°C	-	15	9.8	9.8	9.1	9.1	9.2	9.2	8.9	2.9	8.3	5.5	8.3	4.2	7.9	1.9	7.5	2.0	7.5	7.3	7.2
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 #1	10.14	10.13	10.50	10.44	10.79	10.87	10.71	12.65	10.94	11.91	10.92	12.34	11.13	13.07	11.28	13.60	11.37	11.47	11.38
Specific Conductivity (SPC)	SPCµS/cm	-		181.0	181.0	182.4	182.4	182.9	182.8	182.6	396.3	202.4	248.3	199.1	281.8	202.2	188.9	207.7	120.0	74.5	221.1	209.3
Electrical Conductivity (EC)	SPCµS/cm	-		128.4	128.4	127.1	127.1	127.6	127.7	126.5	229.3	137.9	155.3	135.7	169.9	135.9	105.3	138.2	67.0	50.4	146.2	138.3
Salinity	parts per trillion	-		0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.19	0.10	0.12	0.09	0.13	0.10	0.09	0.10	0.05	0.04	0.11	0.10
pH	pH Units	-	6.5-9.0	7.80	7.95	7.68	7.97	7.34	6.94	7.98	8.11	7.70	7.00	7.84	7.73	7.29	6.36	7.44	8.17	7.67	7.12	7.85
Turbidity	nephelometric units	-		0.0	0.0	0.2	0.3	0.2	0.3	1.4	45.4	6.6	25.6	6.6	21.8	12.3	157.7	16.4	91.8	400.4	19.0	73.1
Physical Parameters																						
Colour	TCU	5		5.7	5.5	5.5	5.2	5.6	5.3	5.8	23.5	9.6	21.4	7.5	10.4	8.2	201	8.4	25.3	10.1	11.5	11.9
Electrical Conductivity (EC)	µS/cm	2		184	185	187	186	187	186	188	403	208	253	205	292	206	184	207	360	200	221	210
Hardness as CaCO3	mg/L	0.5		93.4	96.3	94.5	94.9	95.2	97.3	105	237	106	126	104	151	109	82.3	111	212	110	120	110
pH	pH Units	0.1	6.5-9.0	8.06	8.07	8.08	8.07	8.06	8.06	8.12	8.36	8.18	8.27	8.17	8.32	8.26	7.73	8.23	8.49	8.25	8.27	8.21
Total Suspended Solids (TSS)	mg/L	3		<3	<3	<3	<3	<3	<3	4.7	63.1	9.4	30	10.4	25.6	48.3	75.9	49.3	127	60.7	40.9	149
Total Dissolved Solids (TDS)	mg/L	1		100	102	102	102	101	102	105	264	114	146	112	170	122	148	120	238	122	140	124
Turbidity	NTU	0.1		0.8	0.72	0.67	0.67	0.74	0.79	1.88	59.4	6.51	31.3	6.34	23.9	12.7	66.8	12.7	135	24.2	20.7	134
Anions and Nutrients																						
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		83.5	83.9	85.5	84.8	84.3	83.8	84.3	190	91.8	130	91	144	105	48	100	202	104	107	97.5
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	<1	<1	<1	<1	<1	7.6	<1	<1	<1	4.8	<1	<1	<1	14.4	<1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		83.5	83.9	85.5	84.8	84.3	83.8	84.3	197	91.8	130	91	149	105	48	100	216	104	107	97.5
Ammonia as N	mg/L	0.005	See narrative #2	<0.005	<0.005	0.0137	<0.005	<0.005	<0.005	0.0187	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0303	0.0311	0.0169	0.0108	<0.005	0.007
Bromide	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.59	<0.5	0.61	<0.5	0.85	<0.5	1.41	<0.5	1.73	<0.5	0.97	0.58
Fluoride	mg/L	0.02	See equation #3	0.044	0.042	0.039	0.04	0.039	0.041	0.042	0.102	0.049	0.084	0.05	0.073	0.053	0.081	0.044	0.09	0.044	0.05	0.052
Nitrate and Nitrite (as N)	mg/L	0.0051		0.057	0.0584	0.0587	0.0606	0.0581	0.056	0.0541	<0.0051	0.0507	<0.0051	0.0498	0.0567	0.0504	0.0151	0.0698	0.0304	0.0664	0.0632	0.0559
Nitrate (as N)	mg/L	0.005	32.8	0.057	0.0584	0.0587	0.0606	0.0581	0.056	0.0541	<0.005	0.0507	<0.005	0.0498	0.0567	0.0504	0.0151	0.0698	0.029	0.0664	0.0632	0.0559
Nitrite (as N)	mg/L	0.001	0.06-0.60 #4	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0015	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05		0.11	0.089	0.131	0.119	0.094	0.082	0.12	0.243	0.11	0.226	0.06	0.086	0.137	0.757	0.08	0.385	0.144	0.185	0.214
Nitrogen (Total)	mg/L	0.03		0.229	0.19	0.18	0.156	0.146	0.153	0.184	0.244	0.17	0.249	0.167	0.182	0.165	0.791	0.179	0.429	0.18	0.241	0.213
Orthophosphate (as P) (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0061	<0.001	<0.001	<0.001	<0.001	0.0013
Phosphorus (Total Dissolved)	mg/L	0.002		0.0024	<0.002	<0.002	<0.002	<0.002	<0.002	0.0033	0.0105	0.0024	0.0143	0.0021	0.0094	0.0022	0.0223	0.0036	0.0038	0.003	0.0103	0.0029
Phosphorus	mg/L	0.002		0.0031	0.0031	0.0034	0.0032	0.003	0.0032	0.0064	0.0719	0.0119	0.035	0.0123	0.0273	0.0325	0.109	0.0318	0.103	0.0402	0.0358	0.1
Sulphate	mg/L	0.3		13.5	13.6	13.8	13.8	13.7	13.8	13.8	49.9	17.4	12.2	16.9	19.6	16.2	40.5	16.1	13.3	16.4	22.1	18.5
Silica	mg/L	0.5		4.08	3.93	4.22	4.02	4.08	4.01	4.05	4.59	4.14	2.92	4.04	2.76	3.78	6.97	3.81	5.1	3.86	3.83	4.12
Anions Total	meq/L			1.96	1.97	2	1.99	1.98	1.97	1.98	5	2.2	2.88	2.18	3.42	2.45	1.85	2.34	4.65	2.43	2.64	2.36
Cations Total	meq/L			1.87	1.92	1.89	1.9	1.9	1.95	2.11	4.96	2.12	2.67	2.08	3.17	2.18	2.18	2.22	4.61	2.2	2.58	2.31
Ionic Balance	%			-2.3	-1.1	-2.9	-2.3	-1.9	-0.6	3.2	-0.4	-1.9	-3.7	-2.2	-3.8	-5.8	8.3	-2.7	-0.4	-5.0	-1.2	-1.1
Chlorophyll A	ug/L	-		1.25	1.1	0.974	1.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic and Inorganic Carbon																						
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.35	2.34	2.53	2.4	2.36	2.5	2.43	6.51	2.9	6.54	2.87	2.98	2.83	32.9	3.1	9.86	3.56	4.07	3.85
Total Organic Carbon (TOC)	mg/L	0.5		3.35	3.31	3.21	2.97	3.06	2.84	2.54	7.25	2.9	6.84	2.92	3.52	3.27	37	4.07	10.6	3.61	5.53	5.15
Total Metals																						
Aluminum	mg/L	0.005		0.0325	0.0248	0.03	0.0259	0.0292	0.0274	0.0633	1.26	0.242	1.57	0.238	1.05	0.556	1.79	0.48	2.25	0.552	0.605	2.08
Antimony	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.0005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00098	<0.0005	0.00075	<0.0005	0.00055	0.00057	0.0022	0.00053	0.00194	0.00059	0.00064	0.00164
Barium	mg/L	0.02		0.03	0.032	0.033	0.033	0.033	0.033	0.034	0.118	0.043	0.172	0.045	0.108	0.071	0.09	0.063	0.199	0.062	0.063	0.105
Beryllium	mg/L	0.001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00015	<0.0001	0.00014	<0.0001	<0.0001	0.00013
Bismuth	mg/L	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron - soluble	mg/L	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	mg/L	0.000005		0.0000165	0.0000182	0.000025	0.0000213	0.0000179	0.0000178	0.0000219	0.000143	0.0000383	0.0000614	0.0000335	0.000045	0.0000625	0.000123	0.0000487	0.000145	0.0000594	0.0000528	0.000143
Calcium	mg/L	0.1		27.4	28.6	26.6	27.7	27.5	28.1	27.1	58.8	30.3	37	30.5	43	34.7	23.9	33.8	58	33.9	36.1	32.5
Chromium	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0023	<0.001	0.0025	<0.001	0.0018	0.001	0.0033	<0.001	0.0037	0.001	0.0011	0.0035
Cobalt	mg/L	0.0003	0.11	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.00102	<0.0003	0.00058	<0.0003	0.00047	0.00044	0.00211	0.00038	0.00175	0.00042	0.0005	0.00162
Copper	mg/L	0.001	0.3	<0.001	<0.001	0.0014	0.0012	0.0011	0.0011	<0.001	0.0036	0.0019	0.0026	0.0011	0.0017	0.0021	0.0052	0.0019	0.006	0.002	0.0025	0.0053
Iron	mg/L	0.03	1	<0.03	<0.03	0.032	0.031	0.031	<0.03	0.072	**2.13**	0.274	**1.45**	0.282	**1.14**	0.923	**5.16**	0.823	**4.47**	0.957	**1.07**	**3.62**
Lead	mg/L	0.0005	See equation #5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00101	<0.0005	0.0007	<0.0005	0.00058	<0.0005	0.00188	<0.0005	0.00226	0.0005	0.00057	0.00189
Lithium	mg/L	0.001		0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0013	0.0078	0.0019	0.0051	0.0019	0.0068	0.0029	0.0078	0.0025	0.0051	0.0026	0.0029	0.0049
Magnesium	mg/L	0.1		5.63	5.93	6.04	6.07	6.38	6.13	6.2	16	7.85	11	7.78	11.7	8.32	7.63	8.15	16.6	8.38	8.68	8.39
Manganese	mg/L	0.0001	See equation #6	0.00112	0.0012	0.00158	0.00147	0.00159	0.00159	0.00255	0.0426	0.00652	0.0305	0.00756	0.0181	0.0181	0.0734	0.0168	0.0681	0.0194	0.0201	0.0506
Mercury	mg/L	0.000005		0.000000550	0.000000540	0.000000550	<0.0000005	0.000000500	0.00000054	0.00000076	0.000006	0.00000102	0.00000285	0.00000121	0.00000252	0.0000027	0.00000948	0.00000255	0.00000842	0.00000239	0.00000286	0.0000094
Methyl Mercury	ug/L	0.00000002		0.000000021	<0.00000002	<0.00000002	<0.00000002	<0.00000002	0.000000021	<0.00000002	0.000000043	0.000000047	0.000000055	0.000000028	0.000000031	0.000000062	0.000000449	0.000000033	0.000000083	0.000000054	0.000000137	0.000000059
Molybdenum	mg/L	0.001	2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0033	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.0011
Nickel	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0054	0.0011	0.0033	0.0012	0.0022	0.0022	0.0092	0.0019	0.0073	0.0022	0.0024	0.0061
Phosphorus	mg/L	0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Potassium	mg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Selenium	mg/L	0.00005	0.002	0.000279	0.000313	0.000277	0.000274	0.000311	0.000284	0.000316	0.00124	0.000311	0.000216	0.000351	0.000607	0.000352	0.000344	0.000329	0.000302	0.000256	0.00044	0.00046
Silicon	mg/L	0.1		2.15	2.11	2.13	2.15	2.16	2.13	2.43	3.74	2.44	4.53	2.41	3.43	2.51	5.7	2.56	5.51	2.67	2.63	4.77
Silver	mg/L	0.00002	0.0001 or 0.003 #7	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.000022	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.000043	<0.00002	0.000043	<0.00002	<0.00002	0.000038
Sodium	mg/L	2		<2	<2	<2	<2	<2	<2	<2	4.1	<2	2.8	<2	2.8	<2	9.5	<2	8.8	<2	3.5	2.3
Strontium	mg/L	0.005		0.109	0.11	0.107	0.111	0.11	0.113	0.105	0.324	0.114	0.0915	0.112	0.139	0.133	0.0877	0.122	0.227	0.13	0.14	0.131
Thallium	mg/L	0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000042	<0.00001	0.00003	<0.00001	0.000023	0.000018	0.000049	0.000016	0.000065	0.000024	0.000022	0.00006
Tin	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Titanium	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	<0.01	0.051	<0.01	<0.024	<0.01	0.012	<0.01	0.019	<0.01	<0.01	0.022
Uranium	mg/L	0.0002		0.00049	0.0005	0.00048	0.0005	0.00049	0.00051	0.00049	0.0009	0.00052	0.00037	0.00052	0.00041	0.00048	0.00041	0.00048	0.00069	0.0005	0.00053	0.00061
Vanadium	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00053	0.00552	0.00116	0.00528	0.00115	0.00369	0.00242	0.00677	0.00214	0.00857	0.00252	0.00259	0.00772
Zinc	mg/L	0.005	See equation #8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0118	<0.005	0.0086	<0.005	0.0052	0.0053	0.0187	<0.005	0.0196	<0.005	0.0054	0.0189
Dissolved Metals																						
Aluminum (Filtered)	mg/L	0.005	0.1 #9	0.0101	0.0063	0.0075	0.0066	0.0056	0.0089	0.0303	**0.175**	0.0313	**0.191**	0.0276	**0.246**	0.0227	**0.278**	0.0456	0.0571	0.0448	**0.155**	0.0216
Antimony (Filtered)	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic (Filtered)	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00068	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Barium (Filtered)	mg/L	0.02		0.031	0.031	0.033	0.032	0.033	0.033	0.033	0.085	0.041	0.148	0.041	0.099	0.051	0.042	0.047	0.138	0.048	0.053	0.041
Beryllium (Filtered)	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Filtered)	mg/L	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron - soluble (Filtered)	mg/L	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium (Filtered)	mg/L	0.000005	See equation #10	0.0000098	0.0000118	0.0000098	0.0000093	0.0000136	0.0000127	0.0000159	0.0000408	0.0000152	0.0000242	0.0000157	0.0000278	0.0000137	0.0000423	0.0000135	0.0000083	0.0000118	0.0000227	0.0000174
Calcium (Filtered)	mg/L	0.1		26.6	27.4	26.7	27.2	26.9	27.6	30.6	64.9	31.3	35.6	30.4	43.2	31.4	22	32.1	57.7	31.9	34.2	30.1
Chromium (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (Filtered)	mg/L	0.0003		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.00065	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Copper (Filtered)	mg/L	0.001	See BC BLM #11	0.0011	0.0011	<0.001	<0.001	<0.001	<0.001	0.0013	0.0015	0.0014	0.0014	<0.001	0.0012	<0.001	0.0023	<0.001	0.0013	0.001	0.0013	0.0012
Iron (Filtered)	mg/L	0.03	0.35	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.239	0.036	0.228	<0.03	0.23	<0.03	**1.33**	0.043	0.052	0.052	0.141	0.105
Ferrous Iron (Filtered)	mg/L	0.02																				
Lead (Filtered)	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Lithium (Filtered)	mg/L	0.001		0.0011	0.0011	0.0012	0.0012	0.0012	0.0012	0.0011	0.0066	0.0017	0.0038	0.0017	0.0061	0.0021	0.006	0.002	0.0027	0.0019	0.0025	0.0022
Magnesium (Filtered)	mg/L	0.1		6.56	6.74	6.75	6.57	6.82	6.89	7.01	18.2	6.73	9.07	6.8	10.5	7.43	6.62	7.38	16.4	7.3	8.48	8.43
Manganese (Filtered)	mg/L	0.0001		0.00064	0.00037	0.00056	0.00061	0.00054	0.00061	0.00129	0.0165	0.00237	0.0162	0.00258	0.00791	0.00225	0.0394	0.00321	0.00788	0.00315	0.00706	0.00412
Mercury (Filtered)	mg/L	0.000005		<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	<0.0000005	0.0000014	0.00000052	0.00000179	<0.0000005	0.00000144	<0.0000005	0.00000196	0.00000068	0.00000090	0.00000052	0.00000109	0.00000051
Methyl Mercury (Filtered)	mg/L	0.00000002		0.000000026	<0.00000002	<0.00000002	0.000000029	0.000000026	<0.00000002	0.000000021	0.000000044	0.000000034	0.000000058	0.000000022	0.000000034	0.000000060	0.000000428	0.000000028	0.000000045	0.000000025	0.000000039	0.000000033
Molybdenum (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0031	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Filtered)	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0026	<0.001	0.0017	<0.001	0.0011	<0.001	0.0051	<0.001	0.0014	<0.001	0.0011	0.0012
Phosphorus (filtered) (Filtered)	mg/l	0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Potassium (Filtered)	mg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Selenium (Filtered)	mg/L	0.00005		0.000242	0.000277	0.000316	0.000273	0.000303	0.000254	0.000243	0.00141	0.000273	0.000207	0.000326	0.000486	0.00036	0.000194	0.000308	0.000168	0.000303	0.000376	0.000319
Silicon (Filtered)	mg/L	0.05		2	2.07	2.11	2.09	2.09	2.1	2.08	2.25	2.13	1.84	2.12	1.85	2	3.75	2.04	2.74	2	2.05	1.98
Silver (Filtered)	mg/L	0.00002		<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Sodium (Filtered)	mg/L	2		<2	<2	<2	<2	<2	<2	<2	4.4	<2	2.7	<2	2.6	<2	9.9	<2	8.4	<2	3.5	2.4
Strontium (Filtered)	mg/L	0.005		0.102	0.102	0.102	0.105	0.104	0.104	0.109	0.29	0.116	0.0868	0.111	0.142	0.116	0.0798	0.12	0.237	0.124	0.133	0.116
Thallium (Filtered)	mg/L	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Tin (Filtered)	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Titanium (Filtered)	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium (Filtered)	mg/L	0.0002		0.00043	0.00046	0.00046	0.00045	0.00045	0.00046	0.00045	0.00076	0.00052	0.00031	0.00053	0.00037	0.00045	0.00029	0.00048	0.00045	0.00049	0.00052	0.00047
Vanadium (Filtered)	mg/L	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008	<0.0005	0.00069	<0.0005	0.00085	<0.0005	0.00089	<0.0005	<0.0005	<0.0005	0.00075	<0.0005
Zinc (Filtered)	mg/L	0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES:

BC MOE 2019	British Columbia Ministry of Environment (BC MOE). 2019. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.
H	Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required.
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement.
#2	Guideline for ammonia nitrogen (NH_3) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2019 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0 degC.
#3	Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L.
#4	Guideline for nitrite varies with chloride concentrations.
#5	Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273*\ln(H)-1.460)}]/1000$ when H=8-360 mg/L
#6	Guideline for manganese varies with H and is calculated in mg/L and based on equation: (0.01102*H)+0.54, when H =25-259 mg/L.
#7	Guideline for silver varies with H. Guideline is 0.0001 mg/L when H<100 mg/L or 0.003 mg/L when H>100 mg/L
#8	Guideline for zinc varies with H. Guideline is 0.033 mg/L when H is <90 mg/L. Calculated in mg/L and based on equation: [33+0.75*(H-90)]/1000, when H=90-500 mg/L.
#9	Guideline for aluminum varies with pH. Guideline is 0.1 mg/L if pH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$ and pH < 6.5.
#10	Guideline for cadmium varies with H and is calculated in mg/L and based on equation: $[e^{(1.03*\ln(H)-5.274)}]/1000$, when H=7-455 mg/L.
#11	Guidelines for copper are derived through the BC Biotic Ligand Model (BLM). Acute dissolved copper guideline values for each sample location are calculated using the simplified BC BLM model.
-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of the applied guideline.
MPN	Most Probable Number
CFU	Colony Forming Units

Table 12: May 2019 Surface Water Quality Results Summary for Duplicate Analysis

Parameter			PR2	DUPLICATE 1	RPD Analysis	D1-SHALLOW	DUPLICATE 2	RPD Analysis
Sample Date	Reported Detection Limit (RDL)	Unit	5/26/2019	5/26/2019		5/25/2019	5/25/2019	
Laboratory Identification Number			L2279325-2	L2279325-5		L2279324-3	L2279324-5	
Physical Parameters								
Colour	5	Col. Unit	10.1	10.4		10	9.9	
Electrical Conductivity (EC)	2	µS/cm	190	191	1	193	193	0
Hardness as $CaCO_3$	0.5	mg/L	97.6	93	5	93.6	93.3	0
pH	0.1	pH Units	8.12	8.13	0	8.18	8.18	0
Total Suspended Solids (TSS)	3	mg/L	12.6	11.6		<3	<3	
Total Dissolved Solids (TDS)	1	mg/L	107	105	2	103	103	0
Turbidity	0.1	NTU	11.1	9.51	15	3.17	3.2	1
Anions and Nutrients								
Bicarbonate as $CaCO_3$	1	mg/L	88.1	88.1	0	86.8	86.3	1
Carbonate as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Hydroxide as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as $CaCO_3$	1	mg/L	88.1	88.1	0	86.8	86.3	1
Ammonia, Total (as N)	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	<0.5	
Fluoride	0.02	mg/L	0.046	0.048		0.042	0.043	
Nitrate and Nitrite (as N)	0.0051	mg/L	0.0674	0.0679	1	0.0756	0.0763	1
Nitrate (as N)	0.005	mg/L	0.0674	0.0679	1	0.0756	0.0763	1
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Total Kjeldahl Nitrogen	0.05	mg/L	0.141	0.101		0.084	0.094	
Total Nitrogen	0.03	mg/L	0.182	0.193	6	0.171	0.166	3
Orthophosphate (as P)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus (P)-Dissolved	0.002	mg/L	<0.002	<0.002		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.0133	0.0143	7	0.0045	0.0046	
Sulphate (SO4)	0.3	mg/L	15.5	15.5	0	14.3	14.2	1
Silica	0.5	mg/L	7.13	7.22	1	4.8	5.66	16
Anions Total		meq/L	2.09	2.09		2.04	2.03	
Cations Total		meq/L	1.95	1.86		1.87	1.87	
Ionic Balance		N/A	-	-		-	-	
Chlorophyll A	0.01	µg/L	-	-		0.397	0.372	7
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	3.06	3.07	0	2.89	2.82	2
Total Organic Carbon (TOC)	0.5	mg/L	3.24	3.22	1	2.78	2.98	7
Total Metals								
Aluminum	0.005	mg/L	0.316	0.298	6	0.0519	0.0636	20
Antimony	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Arsenic	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Barium	0.02	mg/L	0.048	0.045		0.04	0.039	
Beryllium	0.0001	mg/L	<0.0001	<0.0001		<0.0001	<0.0001	
Bismuth	0.2	mg/L	<0.2	<0.2		<0.2	<0.2	
Boron	0.1	mg/L	<0.1	<0.1		<0.1	<0.1	
Cadmium	0.000005	mg/L	0.0000432	0.0000393	9	0.0000156	0.0000161	
Calcium	0.1	mg/L	28.3	29.1	3	28	27.1	3
Chromium	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Cobalt	0.0003	mg/L	<0.0003	<0.0003		<0.0003	<0.0003	
Copper	0.001	mg/L	0.0013	0.0012		<0.001	<0.001	
Iron	0.03	mg/L	0.381	0.391	3	0.069	0.084	
Lead	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Lithium	0.001	mg/L	0.0018	0.0018		0.0014	0.0013	
Magnesium	0.1	mg/L	7.83	7.1	10	6.41	6.53	2
Manganese	0.0001	mg/L	0.00925	0.00823	12	0.00337	0.00341	1
Mercury	0.000005 or 0.0000005	mg/L	0.00000157	<0.000005		<0.000005	<0.000005	
Methyl mercury	0.00000002	mg/L	0.000000023	0.000000023		<0.000000020	0.000000239	
Molybdenum	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Nickel	0.001	mg/L	0.0014	0.0014	0	<0.001	<0.001	
Phosphorus	0.3	mg/L	<0.3	<0.3		<0.3	<0.3	
Potassium	2	mg/L	<2	<2		<2	<2	
Selenium	0.00005	mg/L	0.000276	0.000277	0	0.00026	0.000251	4
Silicon	0.05	mg/L	2.76	2.55	8	2.21	2.3	4
Silver	0.00002	mg/L	<0.00002	<0.00002		<0.00002	<0.00002	
Sodium	2	mg/L	<2	<2		<2	<2	
Strontium	0.005	mg/L	0.106	0.109	3	0.111	0.11	1
Thallium	0.00001	mg/L	0.000012	0.000011		<0.00001	<0.00001	
Tin	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Titanium	0.01	mg/L	<0.01	<0.01		<0.01	<0.01	
Uranium	0.0002	mg/L	0.00049	0.00049		0.00049	0.00048	
Vanadium	0.0005	mg/L	0.00169	0.00153		<0.0005	<0.0005	
Zinc	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	
Dissolved Metals								
Aluminum	0.005	mg/L	<0.005	<0.005		0.0057	0.0055	
Antimony	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Arsenic	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Barium	0.02	mg/L	0.039	0.04		0.038	0.038	
Berylliium	0.001	mg/L	<0.0001	<0.0001		<0.0001	<0.0001	
Bismuth	0.2	mg/L	<0.2	<0.2		<0.2	<0.2	
Boron	0.1	mg/L	<0.1	<0.1		<0.1	<0.1	
Cadmium	0.000005	mg/L	0.0000103	0.0000087		0.0000101	0.000008	
Calcium	0.1	mg/L	27.7	26.1	6	26.8	27	1
Chromium	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Cobalt	0.0003	mg/L	<0.0003	<0.0003		<0.0003	<0.0003	
Copper	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Iron	0.03	mg/L	<0.03	<0.03		<0.03	<0.03	
Ferrous Iron	0.02	mg/L						
Lead	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Lithium	0.001	mg/L	0.0015	0.0015		0.0013	0.0013	
Magnesium	0.0001	mg/L	6.88	6.77	2	6.49	6.32	3
Manganese	0.0001	mg/L	0.00148	0.00147	1	0.00168	0.00157	7
Mercury	0.000005 or 0.0000005	mg/L	0.00000073	0.00000068		0.00000063	0.00000077	
Methyl mercury	0.00000002	mg/L	<0.000000020	<0.000000020		<0.000000020	<0.000000020	
Molybdenum	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Nickel	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus	0.3	mg/L	<2	<2		<2	<2	
Potassium	2	mg/L	<0.3	<0.3		<0.3	<0.3	
Selenium	0.00005	mg/L	0.000293	0.000335	13	0.000254	0.00023	
Silicon	0.05	mg/L	1.99	1.95	2	2.22	2.11	5
Silver	0.00002	mg/L	<0.00002	<0.00002		<0.00002	<0.00002	
Sodium	2	mg/L	<2	<2		<2	<2	
Strontium	0.005	mg/L	0.105	0.108	3	0.095	0.103	8
Thallium	0.0002	mg/L	<0.0002	<0.0002		<0.0002	<0.0002	
Tin	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Titanium	0.01	mg/L	<0.01	<0.01		<0.01	<0.01	
Uranium	0.0002	mg/L	0.00047	0.00049		0.00043	0.00046	
Vanadium	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Zinc	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	

NOTES:

-	Analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is 5 times greater than the RDL
BOLD	RPDs greater than 20% are shaded in grey and bolded
MPN	Most Probable Number
CFU	Colony Forming Units

Table 12: June 2019 Surface Water Quality Results Summary for Duplicate Analysis

Parameter			PR2	DUPLICATE 1	RPD Analysis	D1-SHALLOW	DUPLICATE 2	RPD Analysis
Sample Date	Reported Detection Limit (RDL)	Unit	6/25/2019	6/25/2019		6/24/2019	6/24/2019	
Laboratory Identification Number			L2298412-2	L2298412-5		L2297595-3	L2297595-5	
Physical Parameters								
Colour	5	Col. Unit	6.1	10.7		5.3	5.1	
Electrical Conductivity (EC)	2	µS/cm	205	205	0	195	186	5
pH	0.1	pH Units	8.27	8.26	0	8.28	8.15	2
Total Suspended Solids (TSS)	3	mg/L	20.2	20.2	0	<3	<3	
Total Dissolved Solids (TDS)	1	mg/L	112	113	1	117	119	2
Turbidity	0.1	NTU	20.5	18.4	11	0.55	0.61	10
Anions and Nutrients								
Bicarbonate as $CaCO_3$	1	mg/L	87.8	89.1	1	85	85.7	1
Carbonate as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Hydroxide as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as $CaCO_3$	1	mg/L	87.8	89.1	1	85	85.7	1
Ammonia, Total (as N)	0.005	mg/L	<0.005	<0.005		0.0115	<0.005	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	0.81	
Fluoride	0.02	mg/L	0.051	0.051		0.043	0.048	
Nitrate and Nitrite (as N)	0.0051	mg/L	0.0562	0.0569	1	0.0442	0.0631	**35**
Nitrate (as N)	0.005	mg/L	0.0562	0.0569	1	0.0442	0.0631	**35**
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Total Kjeldahl Nitrogen	0.05	mg/L	0.149	0.125		0.162	0.12	
Total Nitrogen	0.03	mg/L	0.172	0.187	8	0.215	0.207	4
Orthophosphate (as P)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus (P)-Dissolved	0.002	mg/L	0.0047	0.005		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.0291	0.0319	9	0.0099	0.0039	
Sulphate (SO4)	0.3	mg/L	17.2	17.2	0	15.2	15.3	1
Silica	0.5	mg/L	4.35	4.46	2	4.45	4.54	2
Anions Total		meq/L	2.12	2.14	1	-	-	
Cations Total		meq/L	2.2	2.2	0	-	-	
Ionic Balance		N/A	1.8	1.2		-	-	
Chlorophyll A	0.01	µg/L	-	-		1.41	1.36	4
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	2.9	2.52	14	1.93	2.34	19
Total Organic Carbon (TOC)	0.5	mg/L	2.78	2.96	6	2.97	2.5	17

NOTES:

-	Analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is 5 times greater than the RDL
BOLD	RPDs greater than 20% are shaded in grey and bolded
MPN	Most Probable Number
CFU	Colony Forming Units

Table 12: July 2019 Surface Water Quality Results Summary for Duplicate Analysis

Parameter			PR1	DUPLICATE 1	RPD Analysis	D1-SHALLOW	DUP 2	RPD Analysis
Sample Date	Reported Detection Limit (RDL)	Unit	7/26/2019	7/26/2019		7/25/2019	7/25/2019	
Laboratory Identification Number			L2318094-3	L2318094-4		L2318093-3	L2318093-5	
Physical Parameters								
Colour	5	Col. Unit	5.7	5	13	7.3	6.6	10
Electrical Conductivity (EC)	2	µS/cm	188	188	0	186	186	0
pH	0.1	pH Units	8.21	8.22	0	8.22	8.22	0
Total Suspended Solids (TSS)	3	mg/L	<3	<3		<3	<3	
Total Dissolved Solids (TDS)	1	mg/L	119	114	4	115	114	1
Turbidity	0.1	NTU	0.79	0.74	7	0.77	0.77	0
Anions and Nutrients								
Bicarbonate as $CaCO_3$	1	mg/L	85.1	84.7	0	83.1	84	1
Carbonate as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Hydroxide as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as $CaCO_3$	1	mg/L	85.1	84.7	0	83.1	84	1
Ammonia, Total (as N)	0.005	mg/L	0.0059	0.0051		0.0072	0.0456	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	<0.5	
Fluoride	0.02	mg/L	0.04	0.04		0.046	0.045	
Nitrate and Nitrite (as N)	0.0051	mg/L	0.0589	0.0588	0	0.0272	0.0272	0
Nitrate (as N)	0.005	mg/L	0.0589	0.0588	0	0.0272	0.0272	0
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Total Kjeldahl Nitrogen	0.05	mg/L	0.128	0.138		0.127	0.159	
Total Nitrogen	0.03	mg/L	0.188	0.174	8	0.15	0.195	***26***
Orthophosphate (as P)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus (P)-Dissolved	0.002	mg/L	<0.002	<0.002		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.0039	0.0034		0.0031	0.0026	
Sulphate (SO4)	0.3	mg/L	4.16	3	***32***	14.5	14.4	1
Silica	0.5	mg/L	14.4	14.4	0	3.92	3.95	1
Chlorophyll A	0.01	µg/L	-	-		0.814	0.79	3
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	2.22	2.46	10	2.76	2.9	5
Total Organic Carbon (TOC)	0.5	mg/L	2.46	2.54	3	2.84	2.97	4

NOTES:

-	Analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is 5 times greater than the RDL
BOLD	RPDs greater than 20% are shaded in grey and bolded
MPN	Most Probable Number
CFU	Colony Forming Units

Table 12: August 2019 Surface Water Quality Results Summary for Duplicate Analysis

Parameter			PR1	DUPLICATE 1	RPD Analysis	D1-SHALLOW	DUP 2	RPD Analysis
Sample Date	Reported Detection Limit (RDL)	Unit	8/23/2019	8/23/2019		8/22/2019	8/22/2019	
Laboratory Identification Number			L2334987-3	L2334987-4		L2334419-3	L2334419-5	
Physical Parameters								
Colour	5	Col. Unit	8.6	8.8	2	9.1	9.9	8
Electrical Conductivity (EC)	2	µS/cm	190	190	0	191	190	1
pH	0.1	pH Units	8.21	8.2	0	8.17	8.17	0
Total Suspended Solids (TSS)	3	mg/L	6.4	4.8		4.4	5.4	
Total Dissolved Solids (TDS)	1	mg/L	120	121	1	123	124	1
Turbidity	0.1	NTU	5.15	5.62	9	6.98	7.37	5
Anions and Nutrients								
Bicarbonate as $CaCO_3$	1	mg/L	87.7	91.3	4	86.9	85.9	1
Carbonate as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Hydroxide as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as $CaCO_3$	1	mg/L	87.7	91.3	4	86.9	85.9	1
Ammonia, Total (as N)	0.005	mg/L	<0.005	<0.005		0.0157	<0.005	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	<0.5	
Fluoride	0.02	mg/L	0.039	0.04		0.039	0.045	
Nitrate and Nitrite (as N)	0.0051	mg/L	0.062	0.0622	0	0.0584	0.0552	6
Nitrate (as N)	0.005	mg/L	0.062	0.0622	0	0.0584	0.0552	6
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Total Kjeldahl Nitrogen	0.05	mg/L	0.12	0.101		0.095	0.073	
Total Nitrogen	0.03	mg/L	0.178	0.171	4	0.183	0.166	10
Orthophosphate (as P)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus (P)-Dissolved	0.002	mg/L	<0.002	<0.002		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.0088	0.0083		0.008	0.007	
Sulphate (SO4)	0.3	mg/L	13.1	13.5	3	13.9	13.8	1
Silica	0.5	mg/L	4.34	4.45	3	4.29	4.25	1
Chlorophyll A	0.01	µg/L	-	-		0.821	1.2	**38**
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	3.13	3.35	7	3	2.93	2
Total Organic Carbon (TOC)	0.5	mg/L	3.03	3.05	1	3.11	2.99	4

NOTES:

-	Analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is 5 times greater than the RDL
BOLD	RPDs greater than 20% are shaded in grey and bolded
MPN	Most Probable Number
CFU	Colony Forming Units

Table 12: September 2019 Surface Water Quality Results Summary for Duplicate Analysis

Parameter			PR1	DUPLICATE 1	RPD Analysis	D1-SHALLOW	DUP 2	RPD Analysis
Sample Date	Reported Detection Limit (RDL)	Unit	9/25/2019	9/25/2019		9/24/2019	9/24/2019	
Laboratory Identification Number			L2354314-3	L2354314-4		L2353324-3	L2353324-5	
Physical Parameters								
Colour	5	Col. Unit	6.3	6.4	2	6	7.1	17
Electrical Conductivity (EC)	2	µS/cm	189	189	0	189	187	1
pH	0.1	pH Units	8.25	8.25	0	8.21	8.15	1
Total Suspended Solids (TSS)	3	mg/L	<3	<3		<3	<3	
Total Dissolved Solids (TDS)	1	mg/L	108	109	1	115	110	4
Turbidity	0.1	NTU	1.11	1.12	1	1.02	1.01	1
Anions and Nutrients								
Bicarbonate as $CaCO_3$	1	mg/L	94.4	94.3	0	84.1	85.6	2
Carbonate as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Hydroxide as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as $CaCO_3$	1	mg/L	94.4	94.3	0	84.1	85.6	2
Ammonia, Total (as N)	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	<0.5	
Fluoride	0.02	mg/L	0.038	0.04		0.037	0.037	0
Nitrate and Nitrite (as N)	0.0051	mg/L	0.0571	0.0586	3	0.0611	0.0611	0
Nitrate (as N)	0.005	mg/L	0.0571	0.0586	3	0.06	0.06	0
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		0.0011	0.0011	
Total Kjeldahl Nitrogen	0.05	mg/L	0.077	0.067		0.088	0.088	
Total Nitrogen	0.03	mg/L	0.106	0.123		0.144	0.151	
Orthophosphate (as P)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus (P)-Dissolved	0.002	mg/L	<0.002	<0.002		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.004	0.0038		0.0039	0.0035	
Sulphate (SO4)	0.3	mg/L	14.4	14.5	1	14.4	14.4	0
Silica	0.5	mg/L	4.45	4.97	11	4.49	4.57	2
Anions Total		meq/L	2.19	2.19	0	-	-	
Cations Total		meq/L	1.94	1.96	1	-	-	
Ionic Balance		N/A	-6.3	-5.7	10	-	-	
Chlorophyll A	0.01	µg/L	-	-		1.01	0.825	20
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	2.49	2.48	0	2.75	2.63	4
Total Organic Carbon (TOC)	0.5	mg/L	2.38	2.37	0	3.3	2.77	17

NOTES:

-	Analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is 5 times greater than the RDL
BOLD	RPDs greater than 20% are shaded in grey and bolded
MPN	Most Probable Number
CFU	Colony Forming Units

Table 12: October 2019 Surface Water Quality Results Summary for Duplicate Analysis

Parameter			PR1	DUPLICATE 1	RPD Analysis	D1-SHALLOW	DUP 2	RPD Analysis
Sample Date	Reported Detection Limit (RDL)	Unit	10/24/2019	10/24/2019		10/24/2019	10/24/2019	
Laboratory Identification Number			L2372209-7	L2372209-8		L2372209-3	L2372209-5	
Physical Parameters								
Colour	5	Col. Unit	5.3	5.6	6	5.5	5.2	6
Electrical Conductivity (EC)	2	µS/cm	186	186	0	187	187	0
Hardness as $CaCO_3$	0.5	mg/L	97.3	95.7	2	94.5	96.9	3
pH	0.1	pH Units	8.06	8.08	0	8.08	8.06	0
Total Suspended Solids (TSS)	3	mg/L	<3	<3		<3	<3	
Total Dissolved Solids (TDS)	1	mg/L	102	101	1	102	102	0
Turbidity	0.1	NTU	0.79	0.77	3	0.67	0.65	3
Anions and Nutrients								
Bicarbonate as $CaCO_3$	1	mg/L	83.8	83.6	0	85.5	84.3	1
Carbonate as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Hydroxide as $CaCO_3$	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as $CaCO_3$	1	mg/L	83.8	83.6	0	85.5	84.3	1
Ammonia, Total (as N)	0.005	mg/L	<0.005	0.0074		0.0137	<0.005	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	<0.5	
Fluoride	0.02	mg/L	0.041	0.041		0.039	0.046	16
Nitrate and Nitrite (as N)	0.0051	mg/L	0.056	0.0563	1	0.0587	0.0586	0
Nitrate (as N)	0.005	mg/L	0.056	0.0563	1	0.0587	0.0586	0
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Total Kjeldahl Nitrogen	0.05	mg/L	0.082	0.116		0.131	0.108	
Total Nitrogen	0.03	mg/L	0.153	0.197	***25***	0.18	0.156	14
Orthophosphate (as P)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus (P)-Dissolved	0.002	mg/L	<0.002	<0.002		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.0032	0.0032		0.0034	0.0034	
Sulphate (SO4)	0.3	mg/L	13.8	13.7	1	13.8	13.8	0
Silica	0.5	mg/L	4.01	4.04	1	4.22	4.01	5
Anions Total		meq/L	1.97	1.96		2	1.98	
Cations Total		meq/L	1.95	1.91		1.89	1.94	
Ionic Balance		%	-0.6	-1.3		-2.9	-1.0	
Chlorophyll A	0.01	µg/L	-	-		0.974	0.86	12
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	2.5	2.49	0	2.53	2.3	10
Total Organic Carbon (TOC)	0.5	mg/L	2.84	2.62	8	3.21	3.13	3
Total Metals								
Aluminum	0.005	mg/L	0.0274	0.0267	3	0.03	0.0296	1
Antimony	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Arsenic	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Barium	0.02	mg/L	0.033	0.033		0.033	0.033	
Beryllium	0.001	mg/L	<0.0001	<0.0001		<0.0001	<0.0001	
Bismuth	0.2	mg/L	<0.2	<0.2		<0.2	<0.2	
Boron	0.1	mg/L	<0.1	<0.1		<0.1	<0.1	
Cadmium	0.000005	mg/L	0.0000178	0.0000159		0.000025	0.0000213	
Calcium	0.1	mg/L	28.1	28.7	2	26.6	29.8	11
Chromium	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Cobalt	0.0003	mg/L	<0.0003	<0.0003		<0.0003	<0.0003	
Copper	0.001	mg/L	0.0011	<0.001		0.0014	<0.001	
Iron	0.03	mg/L	<0.03	0.031		0.032	0.032	
Lead	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Lithium	0.001	mg/L	0.0012	0.0012		0.0012	0.0013	
Magnesium	0.1	mg/L	6.13	6.11	0	6.04	6.06	0
Manganese	0.0001	mg/L	0.00159	0.00159	0	0.00158	0.00156	1
Mercury	0.000005 or 0.0000005	mg/L	0.00000054	<0.0000005		0.00000055	0.00000050	
Methyl mercury	0.00000002	mg/L	2.10E-08	<2.0E-8		<2.0E-8	<2.0E-8	
Molybdenum	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Nickel	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus	0.3	mg/L	<0.3	<0.3		<0.3	<0.3	
Potassium	2	mg/L	<2	<2		<2	<2	
Selenium	0.00005	mg/L	0.000284	0.000296	4	0.000277	0.000263	5
Silicon	0.05	mg/L	2.13	2.13	0	2.13	2.07	3
Silver	0.00002	mg/L	<0.00002	<0.00002		<0.00002	<0.00002	
Sodium	2	mg/L	<2	<2		<2	<2	
Strontium	0.005	mg/L	0.113	0.114	1	0.107	0.118	10
Thallium	0.0002	mg/L	<0.00001	<0.00001		<0.00001	<0.00001	
Tin	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Titanium	0.01	mg/L	<0.01	<0.01		<0.01	<0.01	
Uranium	0.0002	mg/L	0.00051	0.00053		0.00048	0.00055	
Vanadium	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Zinc	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	
Dissolved Metals								
Aluminum	0.005	mg/L	0.0089	0.0065		0.0075	0.0072	
Antimony	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Arsenic	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Barium	0.02	mg/L	0.033	0.033		0.033	0.034	
Beryllium	0.001	mg/L	<0.0001	<0.0001		<0.0001	<0.0001	
Bismuth	0.2	mg/L	<0.2	<0.2		<0.2	<0.2	
Boron	0.1	mg/L	<0.1	<0.1		<0.1	<0.1	
Cadmium	0.000005	mg/L	0.0000127	0.0000132		0.0000098	0.0000133	
Calcium	0.1	mg/L	27.6	27	2	26.7	27.4	3
Chromium	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Cobalt	0.0003	mg/L	<0.0003	<0.0003		<0.0003	<0.0003	
Copper	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Iron	0.03	mg/L	<0.03	<0.03		<0.03	<0.03	
Lead	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Lithium	0.001	mg/L	0.0012	0.0012		0.0012	0.0012	
Magnesium	0.1	mg/L	6.89	6.88	0	6.75	6.94	3
Manganese	0.0001	mg/L	0.00061	0.00066	8	0.00056	0.00057	2
Mercury	0.000005 or 0.0000005	mg/L	<0.0000005	<0.0000005		<0.0000005	<0.0000005	
Methyl mercury	0.00000002	mg/L	<2.0E-8	<2.0E-8		<2.0E-8	<2.0E-8	
Molybdenum	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Nickel	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Phosphorus	0.3	mg/L	<0.3	<0.3		<0.3	<0.3	
Potassium	2	mg/L	<2	<2		<2	<2	
Selenium	0.00005	mg/L	0.000254	0.000295	15	0.000316	0.000287	10
Silicon	0.05	mg/L	2.1	2.08	1	2.11	2.09	1
Silver	0.00002	mg/L	<0.00002	<0.00002		<0.00002	<0.00002	
Sodium	2	mg/L	<2	<2		<2	<2	
Strontium	0.005	mg/L	0.104	0.106	2	0.102	0.102	0
Thallium	0.0002	mg/L	<0.0002	<0.0002		<0.0002	<0.0002	
Tin	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Titanium	0.01	mg/L	<0.01	<0.01		<0.01	<0.01	
Uranium	0.0002	mg/L	0.00046	0.00045		0.00046	0.00046	
Vanadium	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Zinc	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	

NOTES:

-	Analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is 5 times greater than the RDL
BOLD	RPDs greater than 20% are shaded in grey and bolded
MPN	Most Probable Number
CFU	Colony Forming Units

Table 13: October 2019 Sediment Quality Results Summary for Duplicate Analysis

Parameter		Reported Detection Limit (RDL)	HD	DUP1	RPD Analysis	W1	DUP2	RPD Analysis
Sample Date	**Unit**		**10/25/2019**	**10/25/2019**		**10/24/2019**	**10/24/2019**	
Laboratory Identification Number			L2372211-1	L2372211-3		L2372206-1	L2372206-3	
Particle Size (Soil)								
% Sand (0.125mm - 0.063mm)	%	1	5.5	5.2	5.6	24.6	22.8	7.6
% Sand (0.25mm - 0.125mm)	%	1	45.3	41.2	9.5	<1	<1	
% Sand (0.50mm - 0.25mm)	%	1	24.7	25.5	3.2	<1	<1	
% Clay (<4um)	%	1	3.1	3		6.3	8.2	26.2
% Gravel (>2mm)	%	1	8.5	11.4	29.1	<1	<1	
% Sand (1.00mm - 0.50mm)	%	1	2.9	3.3		<1	<1	
% Silt (0.0312mm - 0.004mm)	%	1	4.8	5.1		35.3	36.3	2.8
% Silt (0.063mm - 0.0312mm)	%	1	3.1	3.2		33.2	31.9	4.0
% Sand (2.00mm - 1.00mm)	%	1	2.1	2.1		<1	<1	
Carbon								
Total Organic Carbon (TOC)	%	0.05	0.58	0.64	9.8	1.14	1.26	10.0
Physical Tests (Soil)								
pH	pH Units	0.1	8.31	8.31	0.0	8.25	8.27	0.2
Anions and Nutrients (Soil)								
Nitrogen (Total)	%	0.02	0.047	0.049		0.035	0.037	
Plant Available Nutrients (Soil)								
Ammonium	mg/kg	1	1.1	1.3		1.1	1.2	
Nitrate (as NO3-N)	mg/kg	2	<2	<2		<2	<2	
Nitrate and Nitrite (as N)	mg/kg	2	<2	<2		<2	<2	
Phosphate	mg/kg	2	<2	<2		<2	<2	
Metals (Soil)								
Aluminum	mg/kg	50	4070	3590	12.5	5970	5390	10.2
Antimony	mg/kg	0.1	0.61	0.59	3.3	0.75	0.76	1.3
Arsenic	mg/kg	0.1	7.94	8.37	5.3	6.24	6.37	2.1
Barium	mg/kg	0.5	366	333	9.4	243	262	7.5
Beryllium	mg/kg	0.1	0.33	0.32		0.26	0.27	
Bismuth	mg/kg	0.2	<0.2	<0.2		<0.2	<0.2	
Boron - soluble	mg/kg	5	<5	<5		<5	<5	
Cadmium	mg/kg	0.02	0.505	0.511	1.2	0.949	0.934	1.6
Calcium	mg/kg	50	18,600	19,600	5.2	56,800	49,900	12.9
Chromium	mg/kg	0.5	8.59	7.92	8.1	15.4	14.5	6.0
Cobalt	mg/kg	0.1	5.56	5.33	4.2	7.58	7.48	1.3
Copper	mg/kg	0.5	10.8	10.4	3.8	16.2	14.5	11.1
Iron	mg/kg	50	20,400	19,400	5.0	15,500	14,400	7.4
Lead	mg/kg	0.5	6.21	5.98	3.8	7.34	7.2	1.9
Lithium	mg/kg	2	5.3	4.8		8	7.1	
Magnesium	mg/kg	20	4270	4530	5.9	14,800	14,800	0.0
Manganese	mg/kg	1	204	194	5.0	395	387	2.0
Mercury	mg/kg	0.005	0.0251	0.0265	5.4	0.0416	0.0392	
Molybdenum	mg/kg	0.1	1.58	1.48	6.5	1.2	1.27	5.7
Nickel	mg/kg	0.5	17.6	17	3.5	24.7	24.1	2.5
Phosphorus	mg/kg	50	1070	1080	0.9	841	898	6.6
Potassium	mg/kg	100	840	710	16.8	820	810	1.2
Selenium	mg/kg	0.2	0.57	0.58		0.3	0.42	
Silver	mg/kg	0.1	0.11	<0.1		0.13	0.14	
Sodium	mg/kg	50	73	77		87	83	
Strontium	mg/kg	0.5	61.7	62.2	0.8	106	96.8	9.1
Sulphur	mg/kg	1000	<1000	<1000		<1000	<1000	
Thallium	mg/kg	0.05	0.088	0.079		0.17	0.168	
Tin	mg/kg	2	<2	<2		<2	<2	
Titanium	mg/kg	1	15.3	13.3	14.0	113	107	5.5
Tungsten	mg/kg	0.5	<0.5	<0.5		<0.5	<0.5	
Uranium	mg/kg	0.05	0.923	0.93	0.8	0.885	0.909	2.7
Vanadium	mg/kg	0.2	21.4	19.3	10.3	33.4	33.2	0.6
Zinc	mg/kg	2	73.2	71.2	2.8	66.3	66.4	0.2
Zirconium	mg/kg	1	1.8	1.8	0.0	2.1	2.8	

NOTES:

-	Analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is 5 times greater than the RDL
BOLD	RPDs greater than 30% are shaded in grey and bolded

Table 14: May 2019 Surface Water Quality Results Summary for Blank Analysis

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK-SW	TRAVEL BLANK
Sample Date			5/26/2019	5/26/2019
Laboratory Identification Number			L2279325-6	L2279325-7
Matrix			Deionized Water	Deionized Water
Physical Parameters				
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
Hardness as CaCO3	mg/L	0.5	<0.5	<0.5
pH	pH Units	0.1	**5.55**	**5.42**
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<1	<1
Turbidity	NTU	0.1	<0.1	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as NO3-N)	mg/L	0.005	<0.005	<0.005
Nitrite (as NO2-N)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05
Nitrogen (Total)	mg/L	0.03	<0.03	<0.03
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	<0.002
Phosphorus	mg/L	0.002	<0.002	<0.002
Sulphate	mg/L	0.3	<0.3	<0.3
Silica			<0.5	<0.5
Anions Total	meq/L		<0.1	<0.1
Cations Total	meq/L		<0.1	<0.1
Ionic Balance	N/A		0	0
Chlorophyll A	ug/L	0.01	<0.01	-
Organic and Inorganic Carbon				
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5
Total Metals				
Aluminum	mg/L	0.005	**0.02**	<0.005
Antimony	mg/L	0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.0005	<0.0005	<0.0005
Barium	mg/L	0.02	<0.02	<0.02
Beryllium	mg/L	0.001	<0.0001	<0.0001
Bismuth	mg/L	0.2	<0.2	<0.2
Boron - soluble	mg/L	0.1	<0.1	<0.1
Cadmium	mg/L	0.000005	<0.000005	<0.000005
Calcium	mg/L	0.1	<0.1	<0.1
Chromium	mg/L	0.001	<0.001	<0.001
Cobalt	mg/L	0.0003	<0.0003	<0.0003
Copper	mg/L	0.001	<0.001	<0.001
Iron	mg/L	0.03	<0.03	<0.03
Lead	mg/L	0.0005	<0.0005	<0.0005
Lithium	mg/L	0.001	<0.001	<0.001
Magnesium	mg/L	0.1	<0.1	<0.1
Manganese	mg/L	0.0001	**0.00096**	<0.0001
Mercury	mg/L	0.000005 or 0.0000005	<0.0000005	<0.0000005
Methyl mercury	mg/L	0.00000002	<0.000000020	<0.000000020
Molybdenum	mg/L	0.001	<0.001	<0.001
Nickel	mg/L	0.001	<0.001	<0.001
Phosphorus	mg/L	0.3	<0.3	<0.3
Potassium	mg/L	2	<2	<2
Selenium	mg/L	0.00005	<0.00005	<0.00005
Silicon	mg/L	0.05	<0.1	<0.1
Silver	mg/L	0.00002	<0.00002	<0.00002
Sodium	mg/L	2	<2	<2
Strontium	mg/L	0.005	<0.005	<0.005
Thallium	mg/L	0.0002	<0.00001	<0.00001
Tin	mg/L	0.0005	<0.0005	<0.0005
Titanium	mg/L	0.01	<0.01	<0.01
Uranium	mg/L	0.0002	<0.0002	<0.0002
Vanadium	mg/L	0.0005	<0.0005	<0.0005
Zinc	mg/L	0.005	<0.005	<0.005
Dissolved Metals				
Aluminum (Filtered)	mg/L	0.005	<0.005	-
Antimony (Filtered)	mg/L	0.0005	<0.0005	-
Arsenic (Filtered)	mg/L	0.0005	<0.0005	-
Barium (Filtered)	mg/L	0.02	<0.02	-
Beryllium (Filtered)	mg/L	0.001	<0.0001	-
Bismuth (Filtered)	mg/L	0.2	<0.2	-
Boron - soluble (Filtered)	mg/L	0.1	<0.1	-
Cadmium (Filtered)	mg/L	0.000005	<0.000005	-
Calcium (Filtered)	mg/L	0.1	<0.1	-
Chromium (Filtered)	mg/L	0.001	<0.001	-
Cobalt (Filtered)	mg/L	0.0003	<0.0003	-
Copper (Filtered)	mg/L	0.001	<0.001	-
Iron (Filtered)	mg/L	0.03	<0.03	-
Ferrous Iron (Filtered)	mg/L	0.02		-
Lead (Filtered)	mg/L	0.0005	<0.0005	-
Lithium (Filtered)	mg/L	0.000005	<0.001	-
Magnesium (Filtered)	mg/L	0.1	<0.1	-
Manganese (Filtered)	mg/L	0.0001	<0.0001	-
Mercury (Filtered)	mg/L	0.000005 or 0.0000005	<0.0000005	-
Methyl mercury (Filtered)	mg/L	0.00000002	<0.000000020	-
Molybdenum (Filtered)	mg/L	0.001	<0.001	-
Nickel (Filtered)	mg/L	0.001	<0.001	-
Phosphorus (filtered) (Filtered)	mg/l	0.3	<2	-
Potassium (Filtered)	mg/L	2	<0.3	-
Selenium (Filtered)	mg/L	0.00005	<0.00005	-
Silicon (Filtered)	mg/L	0.05	<0.05	-
Silver (Filtered)	mg/L	0.00002	<0.00002	-
Sodium (Filtered)	mg/L	2	<2	-
Strontium (Filtered)	mg/L	0.005	<0.005	-
Thallium (Filtered)	mg/L	0.0002	<0.0002	-
Tin (Filtered)	mg/L	0.0005	<0.0005	-

NOTES:

-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and underlined indicates an exceedance of the RDL.
CFU	Colony Forming Units
RDL	Reported Detection Limit

Table 14: June 2019 Surface Water Quality Results Summary for Blank Analysis

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK-SW	TRAVEL BLANK
Sample Date			6/25/2019	6/25/2019
Laboratory Identification Number			L2298412-6	L2298411-1
Matrix			Deionized Water	Deionized Water
Physical Parameters				
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
Hardness as CaCO3	mg/L	0.5	<0.5	-
pH	pH Units	0.1	**5.65**	**5.25**
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<1	<10
Turbidity	NTU	0.1	**0.12**	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as NO3-N)	mg/L	0.005	<0.005	<0.005
Nitrite (as NO2-N)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05
Nitrogen (Total)	mg/L	0.03	<0.03	<0.03
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	-
Phosphorus	mg/L	0.002	<0.002	<0.002
Sulphate	mg/L	0.3	<0.3	<0.3
Silica			<0.5	<0.5
Anions Total	meq/L		<0.1	-
Cations Total	meq/L		<0.1	-
Ionic Balance	N/A		0	-
Chlorophyll A	ug/L	0.01	<0.01	-
Organic and Inorganic Carbon				
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5

NOTES:

-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and underlined indicates an exceedance of the RDL.
CFU	Colony Forming Units
RDL	Reported Detection Limit

Table 14: July 2019 Surface Water Quality Results Summary for Blank Analysis

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK	TRAVEL BLANK
Sample Date			7/26/2019	
Laboratory Identification Number			L2318094-5	L2318094-6
Matrix			Deionized Water	Deionized Water
Physical Parameters				
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
pH	pH Units	0.1	**5.52**	**5.41**
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<10	<10
Turbidity	NTU	0.1	**0.25**	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as NO3-N)	mg/L	0.005	<0.005	<0.005
Nitrite (as NO2-N)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05
Nitrogen (Total)	mg/L	0.03	<0.03	<0.03
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	<0.002
Phosphorus	mg/L	0.002	<0.002	<0.002
Sulphate	mg/L	0.3	<0.5	<0.5
Silica	mg/L	0.5	<0.3	<0.3
Chlorophyll A	ug/L	0.01	<0.01	-
Organic and Inorganic Carbon				
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5

NOTES:

-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and underlined indicates an exceedance of the RDL.
CFU	Colony Forming Units
RDL	Reported Detection Limit

Table 14: August 2019 Surface Water Quality Results Summary for Blank Analysis

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK	TRAVEL BLANK
Sample Date			8/23/2019	8/23/2019
Laboratory Identification Number			L2334987-5	L2334987-6
Matrix			Deionized Water	Deionized Water
Physical Parameters				
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
pH	pH Units	0.1	**5.92**	**5.57**
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<10	<10
Turbidity	NTU	0.1	**0.5**	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as NO3-N)	mg/L	0.005	<0.005	<0.005
Nitrite (as NO2-N)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05
Nitrogen (Total)	mg/L	0.03	<0.03	<0.03
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	-
Phosphorus	mg/L	0.002	<0.002	<0.002
Sulphate	mg/L	0.3	<0.3	<0.3
Silica	mg/L	0.5	<0.5	<0.5
Chlorophyll A	ug/L	0.01	<0.01	-
Organic and Inorganic Carbon				
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5

NOTES:

-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and underlined indicates an exceedance of the RDL.
CFU	Colony Forming Units
RDL	Reported Detection Limit

Table 14: September 2019 Surface Water Quality Results Summary for Blank Analysis

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK	TRAVEL BLANK
Sample Date			9/27/2019	9/27/2019
Laboratory Identification Number			L2355994-5	L2355994-6
Matrix			Deionized Water	Deionized Water
Physical Parameters				
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
Hardness as CaCO3	mg/L	0.5	<0.5	<0.5
pH	pH Units	0.1	**6.37**	**6.05**
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<1	<1
Turbidity	NTU	0.1	<0.1	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	0.019
Nitrate (as NO3-N)	mg/L	0.005	<0.005	0.0141
Nitrite (as NO2-N)	mg/L	0.001	<0.001	0.0049
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05
Nitrogen (Total)	mg/L	0.03	<0.03	<0.03
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	-
Phosphorus	mg/L	0.002	<0.002	<0.002
Sulphate	mg/L	0.3	<0.3	<0.3
Silica			<0.5	<0.5
Anions Total	meq/L		<0.1	<0.1
Cations Total	meq/L		<0.1	<0.1
Ionic Balance	N/A		0	-
Chlorophyll A	ug/L	0.01	<0.01	-
Organic and Inorganic Carbon				
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5

NOTES:

-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and underlined indicates an exceedance of the RDL.
CFU	Colony Forming Units
RDL	Reported Detection Limit

Table 14: October 2019 Surface Water Quality Results Summary for Blank Analysis

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK	TRAVEL BLANK
Sample Date			10/26/2019	10/24/2019
Laboratory Identification Number			L2372547-2	L2370749-7
Matrix			Deionized Water	Deionized Water
Physical Parameters				
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
Hardness as CaCO3	mg/L	0.5	<0.5	<0.5
pH	pH Units	0.1	**5.73**	**5.31**
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<1	<1
Turbidity	NTU	0.1	<0.1	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as NO3-N)	mg/L	0.005	<0.005	<0.005
Nitrite (as NO2-N)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05
Nitrogen (Total)	mg/L	0.03	<0.03	**0.062**
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	-
Phosphorus	mg/L	0.002	<0.002	<0.002
Sulphate	mg/L	0.3	<0.3	<0.3
Silica	mg/L		<0.5	<0.5
Anions Total	meq/L		<0.1	<0.1
Cations Total	meq/L		<0.1	<0.1
Ionic Balance	%		0	0
Chlorophyll A	ug/L	0.01	<0.01	-
Organic and Inorganic Carbon				
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5
Total Metals				
Aluminum	mg/L	0.005	0.0079	<0.005
Antimony	mg/L	0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.0005	<0.0005	<0.0005
Barium	mg/L	0.02	<0.02	<0.02
Beryllium	mg/L	0.001	<0.0001	<0.0001
Bismuth	mg/L	0.2	<0.2	<0.2
Boron - soluble	mg/L	0.1	<0.1	<0.1
Cadmium	mg/L	0.000005	<0.000005	<0.000005
Calcium	mg/L	0.1	<0.1	<0.1
Chromium	mg/L	0.001	<0.001	<0.001
Cobalt	mg/L	0.0003	<0.0003	<0.0003
Copper	mg/L	0.001	<0.001	<0.001
Iron	mg/L	0.03	<0.03	<0.03
Lead	mg/L	0.0005	<0.0005	<0.0005
Lithium	mg/L	0.001	<0.001	<0.001
Magnesium	mg/L	0.1	<0.1	<0.1
Manganese	mg/L	0.0001	**0.00023**	<0.0001
Mercury	mg/L	0.000005 or 0.0000005	<0.0000005	<0.0000005
Molybdenum	mg/L	0.001	<0.001	<0.001
Nickel	mg/L	0.001	<0.001	<0.001
Phosphorus	mg/L	0.3	<0.3	<0.3
Potassium	mg/L	2	<2	<2
Selenium	mg/L	0.00005	<0.00005	<0.00005
Silicon	mg/L	0.05	<0.1	<0.1
Silver	mg/L	0.00002	<0.00002	<0.00002
Sodium	mg/L	2	<2	<2
Strontium	mg/L	0.005	<0.005	<0.005
Thallium	mg/L	0.0002	<0.00001	<0.00001
Tin	mg/L	0.0005	<0.0005	<0.0005
Titanium	mg/L	0.01	<0.01	<0.01
Uranium	mg/L	0.0002	<0.0002	<0.0002
Vanadium	mg/L	0.0005	<0.0005	<0.0005
Zinc	mg/L	0.005	<0.005	<0.005
Dissolved Metals				
Aluminum (Filtered)	mg/L	0.005	<0.005	-
Antimony (Filtered)	mg/L	0.0005	<0.0005	-
Arsenic (Filtered)	mg/L	0.0005	<0.0005	-
Barium (Filtered)	mg/L	0.02	<0.02	-
Beryllium (Filtered)	mg/L	0.001	<0.0001	-
Bismuth (Filtered)	mg/L	0.2	<0.2	-
Boron - soluble (Filtered)	mg/L	0.1	<0.1	-
Cadmium (Filtered)	mg/L	0.000005	<0.000005	-
Calcium (Filtered)	mg/L	0.1	<0.1	-
Chromium (Filtered)	mg/L	0.001	<0.001	-
Cobalt (Filtered)	mg/L	0.0003	<0.0003	-
Copper (Filtered)	mg/L	0.001	<0.001	-
Iron (Filtered)	mg/L	0.03	<0.03	
Lead (Filtered)	mg/L	0.0005	<0.0005	-
Lithium (Filtered)	mg/L	0.000005	<0.001	-
Magnesium (Filtered)	mg/L	0.1	<0.1	-
Manganese (Filtered)	mg/L	0.0001	<0.0001	-
Mercury (Filtered)	mg/L	0.000005 or 0.0000005	<0.0000005	-
Methyl mercury (Filtered)	mg/L	0.00000002	<0.00000002	-
Molybdenum (Filtered)	mg/L	0.001	<0.001	-
Nickel (Filtered)	mg/L	0.001	<0.001	-
Phosphorus (filtered) (Filtered)	mg/l	0.3	<0.3	-
Potassium (Filtered)	mg/L	2	<2	-
Selenium (Filtered)	mg/L	0.00005	<0.00005	-
Silicon (Filtered)	mg/L	0.05	<0.05	-
Silver (Filtered)	mg/L	0.00002	<0.00002	-
Sodium (Filtered)	mg/L	2	<2	-
Strontium (Filtered)	mg/L	0.005	<0.005	-
Thallium (Filtered)	mg/L	0.0002	<0.0002	-
Tin (Filtered)	mg/L	0.0005	<0.0005	-
Titanium (Filtered)	mg/L	0.01	<0.01	-
Uranium (Filtered)	mg/L	0.0002	<0.0002	-
Vanadium (Filtered)	mg/L	0.0005	<0.0005	-
Zinc (Filtered)	mg/L	0.005	<0.005	-

NOTES:

-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and underlined indicates an exceedance of the RDL.
CFU	Colony Forming Units
RDL	Reported Detection Limit

Table 15: Summary Statistics

	Peace River Upstream Preconstruction	Peace River Upstream Construction	Peace River Downstream Preconstruction	Peace River Downstream Construction	Tributatries Upstream Preconstruction	Tributaries Upstream Construction	Tributaries Downstream Preconstruction	Tributaries Downstream Construction	Reservoirs Preconstruction	Reservoirs Construction
NITROGEN										
Mean	0.230816667	0.1753125	0.345307692	0.259577586	0.638321429	0.422553191	1.03115	0.731247312	0.167142857	0.154722222
Standard Error	0.028683294	0.011084883	0.046572497	0.02205007	0.155352731	0.08585109	0.231256081	0.0564926	0.022170367	0.003568451
Median	0.179	0.1475	0.253	0.1865	0.29	0.245	0.7645	0.683	0.165	0.1435
Mode	0.05	0.137	0.05	0.14	#N/A	0.248	0.05	1.02	0.05	0.136
Standard Deviation	0.222179839	0.108609228	0.290845153	0.237486518	0.822049384	0.588565419	1.034208636	0.544794909	0.101597385	0.033853295
Sample Variance	0.049363881	0.011795964	0.084590903	0.056399846	0.675765189	0.346409253	1.069587503	0.296801493	0.010322029	0.001146046
Kurtosis	30.23518347	30.07994947	7.425687451	11.07722427	5.034708992	14.07895028	2.603098543	4.708335927	1.151641426	1.775035845
Skewness	4.837530626	5.063767372	2.357075064	3.322018773	2.275799788	3.611828235	1.516926998	1.780517739	1.018026109	1.405123073
Range	1.62	0.852	1.5	1.303	3.39	3.174	4	2.81	0.389	0.161
Minimum	0.05	0.078	0.05	0.117	0.05	0.066	0.05	0.08	0.05	0.111
Maximum	1.67	0.93	1.55	1.42	3.44	3.24	4.05	2.89	0.439	0.272
Sum	13.849	16.83	13.467	30.111	17.873	19.86	20.623	68.006	3.51	13.925
Count	60	96	39	116	28	47	20	93	21	90
PHOSPHORUS										
Mean	0.047279545	1.009670833	0.116473077	0.168130172	0.205910526	0.210612766	0.21585	0.41971087	0.008676923	0.005513333
Standard Error	0.019489969	0.217532561	0.044431137	0.028399931	0.051887079	0.063537573	0.083958707	0.144633679	0.000664691	0.000660687
Median	0.0122	0.01185	0.0594	0.03975	0.1211	0.0522	0.06895	0.09325	0.0086	0.0036
Mode	0.0054	0.002	#N/A	0.133	#N/A	#N/A	#N/A	0.0705	#N/A	0.0036
Standard Deviation	0.129281826	2.131375109	0.226555236	0.305876615	0.226170533	0.435591654	0.290841492	1.387277518	0.002396579	0.006267828
Sample Variance	0.016713791	4.542759856	0.051327275	0.093560504	0.05115311	0.189740089	0.084588774	1.924538913	5.74359E-06	3.92857E-05
Kurtosis	36.55569798	20.14117123	20.42344758	5.635701726	0.00433505	12.36520418	4.905214056	71.42879373	0.556621822	20.35977215
Skewness	5.846138378	3.74319588	4.323899246	2.474288052	1.1778684	3.416523316	2.124862796	8.043807485	0.917415747	4.270042016
Range	0.848	15.098	1.1631	1.5878	0.6396	2.263	1.0012	12.798	0.0081	0.0385
Minimum	0.002	0.002	0.0069	0.0022	0.0104	0.007	0.0071	0.002	0.006	0.002
Maximum	0.85	15.1	1.17	1.59	0.65	2.27	1.0083	12.8	0.0141	0.0405
Sum	2.0803	96.9284	3.0283	19.5031	3.9123	9.8988	2.5902	38.6134	0.1128	0.4962
Count	44	96	26	116	19	47	12	92	13	90
TOTAL ORGANIC CARBON										
Mean	3.363703704	2.864321875	3.761111111	6.705465116	10.14	9.616595745	–	21.69677419	–	2.959574468
Standard Error	0.320380449	0.393310993	0.546637307	0.725642857	6.074350171	1.376931333	–	1.785739254	–	0.057545087
Median	3.02	2.795	3.17	4.165	4.62	6.85	–	19.3	–	2.855
Mode	2.65	2.9	#N/A	3.89	#N/A	8.88	–	13.5	–	2.91
Standard Deviation	1.664745645	3.853644971	1.639911922	6.729335018	13.5826599	9.439765628	–	17.22104572	–	0.557920322
Sample Variance	2.771378063	14.85057956	2.689311111	45.28394978	184.48865	89.10917512	–	296.5644156	–	0.311275086
Kurtosis	20.48162153	49.98503188	5.008459578	6.220203604	4.779714522	8.089542833	–	2.342507382	–	7.982688596
Skewness	4.334598227	6.264511077	2.193840475	2.606813745	2.172677034	2.831200781	–	1.302283365	–	2.619445636
Range	8.77	34.6975	5.19	30.45	32.35	43.93	–	84.13	–	3.16
Minimum	2.43	0.0025	2.56	2.65	1.95	1.57	–	1.67	–	2.22
Maximum	11.2	34.7	7.75	33.1	34.3	45.5	–	85.8	–	5.38
Sum	90.82	274.9749	33.85	576.67	50.7	451.98	–	2017.8	–	278.2
Count	27	96	9	86	5	47	–	93	–	94
IRON										
Mean	0.998380952	1.065962963	2.704208333	5.34274	7.438294118	5.494655172	9.4616	11.0157381	0.107727273	0.159470588
Standard Error	0.506085009	0.475876089	0.806187701	1.131968992	2.922213357	1.69342452	5.045144601	2.447212803	0.027280393	0.057356878
Median	0.155	0.1325	0.7735	1.155	1.81	1.46	3.315	4.055	0.078	0.0365
Mode	0.067	0.031	#N/A	2.7	#N/A	#N/A	#N/A	#N/A	0.078	0.03
Standard Deviation	3.279805712	3.496960793	3.949497007	8.004229506	12.04859433	9.119370127	15.95414807	15.85975161	0.090478827	0.334445197
Sample Variance	10.75712551	12.22873479	15.59852661	64.06768999	145.1686253	83.16291152	254.5348405	251.5317212	0.008186418	0.11185359
Kurtosis	36.63395812	35.72029472	6.135071284	1.669075074	3.925865512	5.57504937	7.520968594	2.427699692	9.643610444	4.767397294
Skewness	5.905862163	5.682389373	2.347554682	1.722874929	2.190713182	2.477798165	2.68164174	1.858780381	3.041427612	2.521982918
Range	21.07	23.87	16.562	28.183	38.203	36.874	52.501	57.326	0.327	1.18
Minimum	0.03	0.03	0.038	0.117	0.197	0.126	0.199	0.074	0.047	0.03
Maximum	21.1	23.9	16.6	28.3	38.4	37	52.7	57.4	0.374	1.21
Sum	41.932	57.562	64.901	267.137	126.451	159.345	94.616	462.661	1.185	5.422
Count	42	54	24	50	17	29	10	42	11	34
CHLOROPHYLL A										
Mean	0.780814815	0.9965	0.866444444	1.5075	0.36936	3.165	–	4.31	–	0.956858696
Standard Error	0.053121348	0.259988942	0.09270849	0.171336657	0.106626777	0.755	–	1.074810061	–	0.045904299
Median	0.788	0.826	0.759	1.445	0.405	3.165	–	5.185	–	0.9125
Mode	0.834	#N/A	#N/A	#N/A	#N/A	#N/A	–	#N/A	–	1.01
Standard Deviation	0.27602662	0.519977884	0.278125471	0.342673314	0.238424722	1.06773124	–	2.149620121	–	0.440298565
Sample Variance	0.076190695	0.270377	0.077353778	0.117425	0.056846348	1.14005	–	4.620866667	–	0.193862826
Kurtosis	0.420589734	0.86676363	1.044827047	2.084479836	-2.840031722	#DIV/0!	–	3.426943029	–	0.024851672
Skewness	0.242099973	1.281595765	1.15353962	1.043002096	-0.220239144	#DIV/0!	–	-1.841417617	–	0.440887067
Range	1.153	1.106	0.856	0.82	0.5122	1.51	–	4.61	–	2.141
Minimum	0.237	0.614	0.584	1.16	0.0938	2.41	–	1.13	–	0.109
Maximum	1.39	1.72	1.44	1.98	0.606	3.92	–	5.74	–	2.25
Sum	21.082	3.986	7.798	6.03	1.8468	6.33	–	17.24	–	88.031
Count	27	4	9	4	5	2	–	4	–	92

PHOTOS

Photo 1 W1 Sampling Location, June 24, 2019
Photo 2 D1 Sampling Location, June 24, 2019
Photo 3 PC1 Sampling Location, June 25, 2019
Photo 4 PR1 Sampling Location, June 25, 2019
Photo 5 PR2 Sampling Location, June 25, 2019
Photo 6 HD Sampling Location, June 25, 2019
Photo 7 PR3 Sampling Location, June 23, 2019
Photo 8 MD Sampling Location, June 23, 2019
Photo 9 PD1 Sampling Location, June 23, 2019
Photo 10 Pine River Sampling Location, June 23, 2019
Photo 11 PD2 Sampling Location, June 22, 2019
Photo 12 Beatton River Sampling Location, June 22, 2019
Photo 13 PD3 Sampling Location, June 22, 2019
Photo 14 Kiskatinaw River Sampling Location, June 22, 2019
Photo 15 PD4 Sampling Location, June 22, 2019
Photo 16 Pouce Coupe Sampling Location, June 22, 2019
Photo 17 PD5 Sampling Location, June 22, 2019

Photo 1: W1 Sampling Location, June 24, 2019

Photo 2: D1 Sampling Location, June 24, 2019

Photo 3: PC1 Sampling Location, June 25, 2019

Photo 4: PR1 Sampling Location, June 25, 2019

Photo 5: PR2 Sampling Location, June 25, 2019

Photo 6: HD Sampling Location, June 25, 2019

Photo 7: PR3 Sampling Location, June 23, 2019

Photo 8: MD Sampling Location, June 23, 2019

Photo 9: PD1 Sampling Location, June 23, 2019

Photo 10: Pine River Sampling Location, June 23, 2019

Photo 11: PD2 Sampling Location, June 22, 2019

Photo 12: Beatton River Sampling Location, June 22, 2019

Photo 13: PD3 Sampling Location, June 22, 2019

Photo 14: Kiskatinaw River Sampling Location, June 22, 2019

Photo 15: PD4 Sampling Location, June 22, 2019

Photo 16: Pouce Coupe Sampling Location, June 22, 2019

Photo 17: PD5 Sampling Location, June 22, 2019

FIGURES

Figure 1 Site Location
Figure 2a Water Quality Monitoring Station Location Plan
Figure 2b Water Quality Monitoring Station Location Plan
Figure 3 Descriptive Analysis of Chlorophyll *a*
Figure 4 Descriptive Analysis of Iron
Figure 5 Descriptive Analysis of Nitrogen
Figure 6 Descriptive Analysis of Phosphorus
Figure 7 Descriptive Analysis of Total Organic Carbon (TOC)

LEGEND

- Site Location
- Populated Place
- Major Road
- Provincial / Territorial / State Boundary
- International Border

NOTES
Base data source:
ESRI Data & Maps

STATUS
ISSUED FOR USE

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

Site Location

PROJECTION	DATUM	CLIENT
BC Albers	NAD83	BC hydro

Scale: 1:9,000,000
150 75 0 150
Kilometres

TETRA TECH

FILE NO. VENW03060-03_Figure01_Site.mxd

OFFICE	DWN	CKD	APVD	REV
Tt-VANC	RG	SL	LH	0

DATE	PROJECT NO.
January 14, 2020	ENW.VENW03060-03

Figure 1

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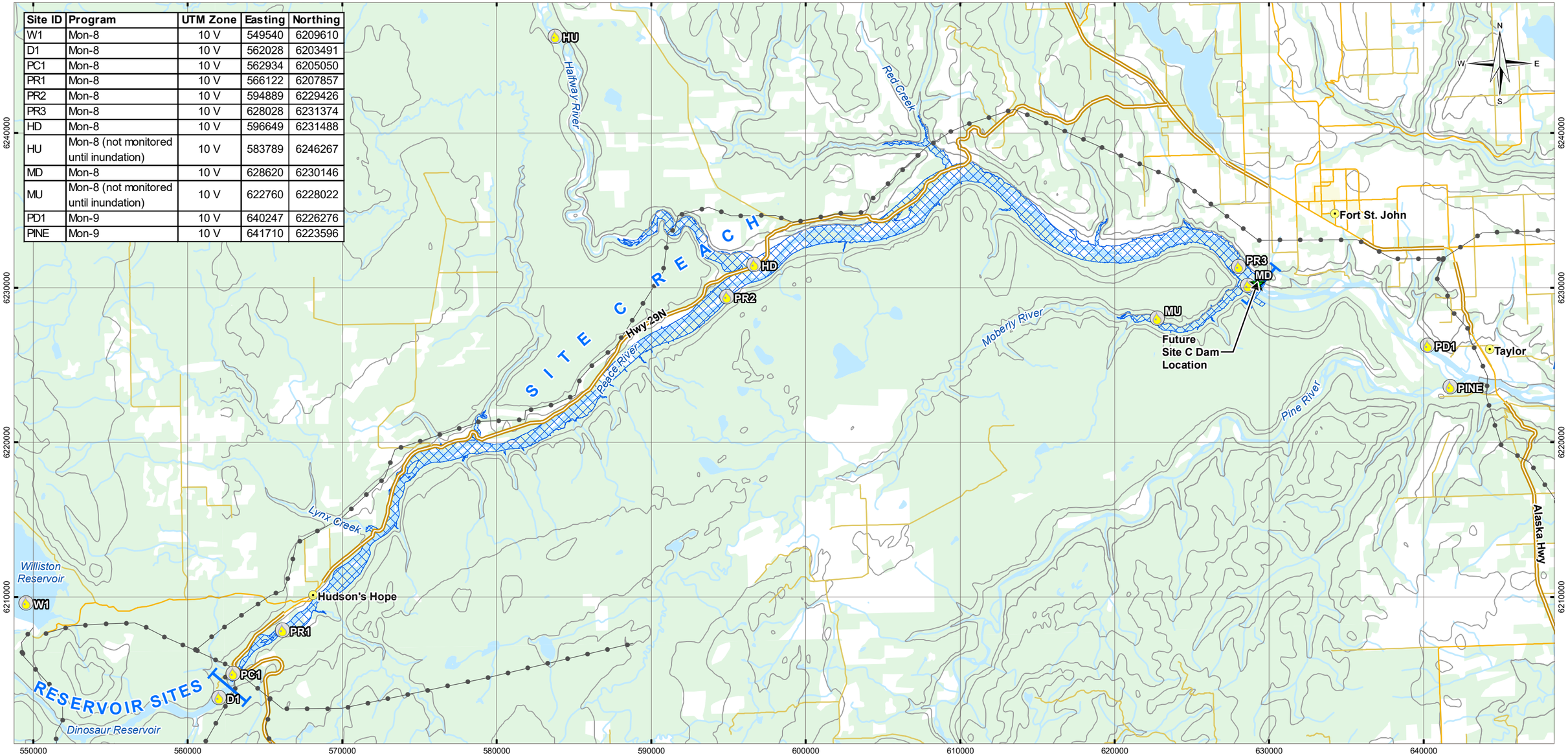
Site ID	Program	UTM Zone	Easting	Northing
W1	Mon-8	10 V	549540	6209610
D1	Mon-8	10 V	562028	6203491
PC1	Mon-8	10 V	562934	6205050
PR1	Mon-8	10 V	566122	6207857
PR2	Mon-8	10 V	594889	6229426
PR3	Mon-8	10 V	628028	6231374
HD	Mon-8	10 V	596649	6231488
HU	Mon-8 (not monitored until inundation)	10 V	583789	6246267
MD	Mon-8	10 V	628620	6230146
MU	Mon-8 (not monitored until inundation)	10 V	622760	6228022
PD1	Mon-9	10 V	640247	6226276
PINE	Mon-9	10 V	641710	6223596



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LEGEND

- Surface Water Monitoring Station / Sediment Sample Location
- Reach Break
- Future Site C Dam Location
- Proposed Site C Reservoir
- Power Line
- Highway
- Main Road
- Local Road
- Contour (100 m)
- Watercourse
- Waterbody
- Residential Area
- Wooded Area
- BC-Alberta Border

NOTES
Base data source:
CanVec 1:250K

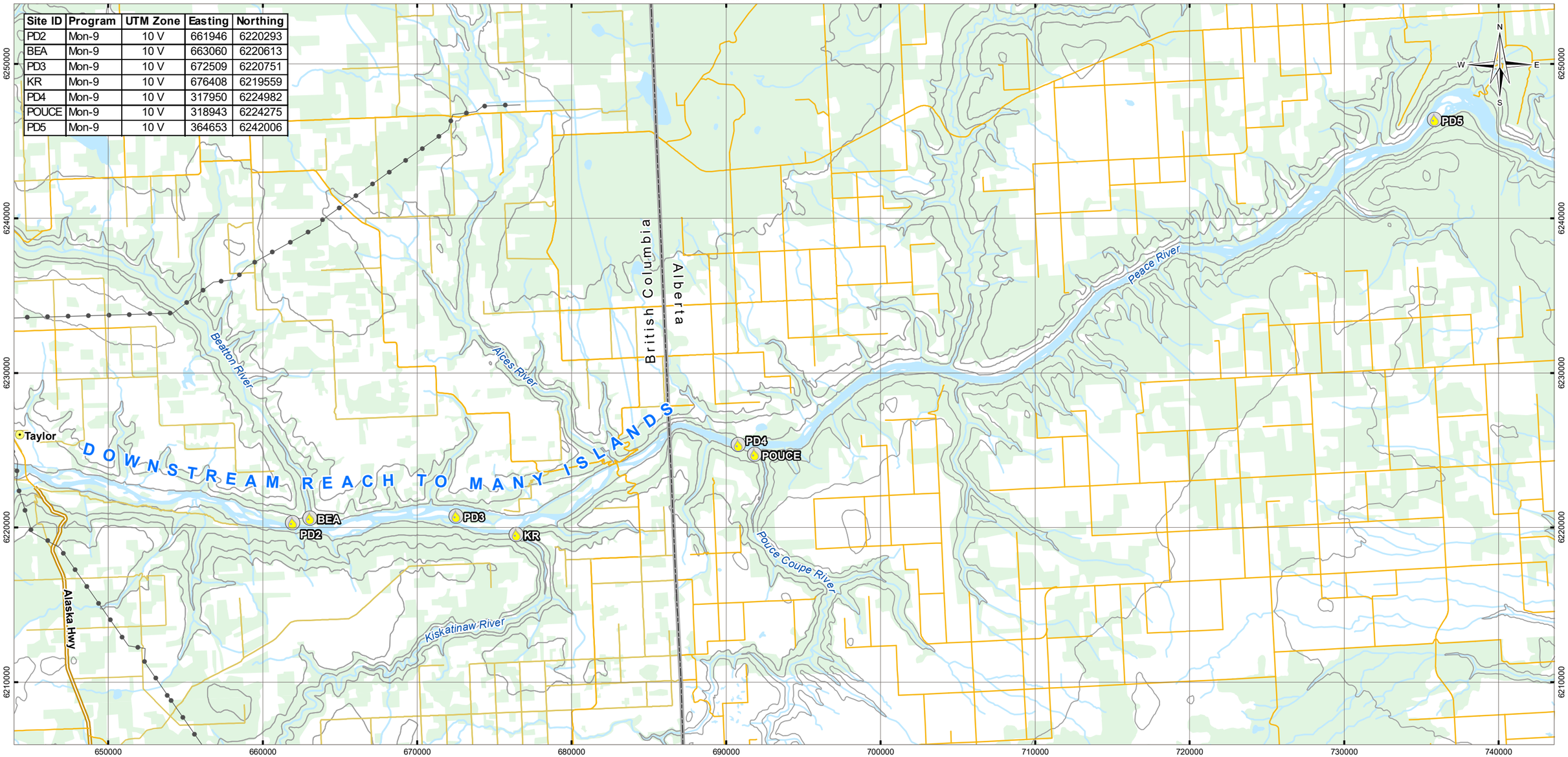
STATUS
ISSUED FOR USE

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

Water Quality Monitoring Station Location Plan

PROJECTION: UTM Zone 10	DATUM: NAD83			CLIENT: BC hydro
Scale: 1:250,000 (5 2.5 0 5 Kilometres)				TETRA TECH
FILE NO.: VENW03060-03_Figure02a_WQMon.mxd				
OFFICE: Tt-VANC	DWN: SL/RG	CKD: SL	APVD: DM	REV: 0
DATE: January 14, 2020	PROJECT NO.: ENW.VENW03060-03			Figure 2a

Site ID	Program	UTM Zone	Easting	Northing
PD2	Mon-9	10 V	661946	6220293
BEA	Mon-9	10 V	663060	6220613
PD3	Mon-9	10 V	672509	6220751
KR	Mon-9	10 V	676408	6219559
PD4	Mon-9	10 V	317950	6224982
POUCE	Mon-9	10 V	318943	6224275
PD5	Mon-9	10 V	364653	6242006



LEGEND

- Surface Water Monitoring Station / Sediment Sample Location
- Power Line
- Highway
- Main Road
- Local Road
- Contour (100 m)
- Watercourse
- Waterbody
- Residential Area
- Wooded Area
- BC-Alberta Border

NOTES
Base data source:
CanVec 1:250K

STATUS
ISSUED FOR USE

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

Water Quality Monitoring Station Location Plan

PROJECTION UTM Zone 10				**DATUM** NAD83	
Scale: 1:250,000					
5 2.5 0 5 Kilometres					
FILE NO. VENW03060-03_Figure02b_WQMon.mxd					
OFFICE TI-VANC	**DWN** SL/RG	**CKD** SL	**APVD** DM	**REV** 0	
DATE January 14, 2020	**PROJECT NO.** ENW.VENW03060-03				

CLIENT BC hydro

TETRA TECH

Figure 2b

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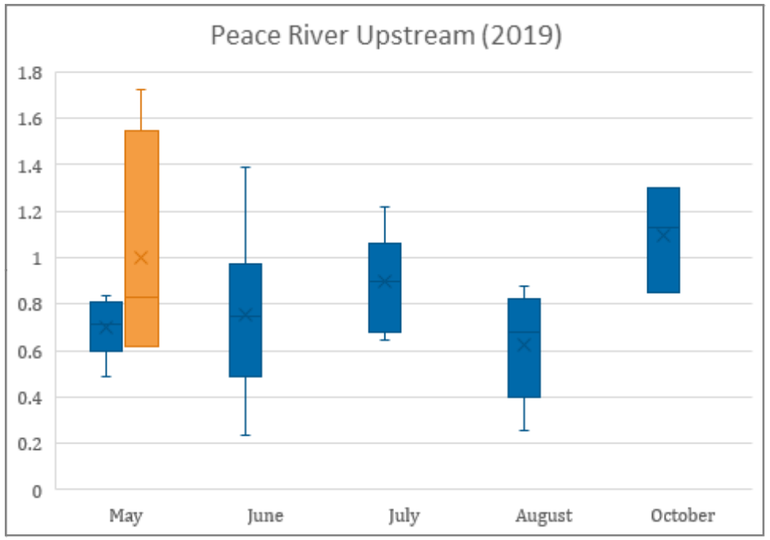

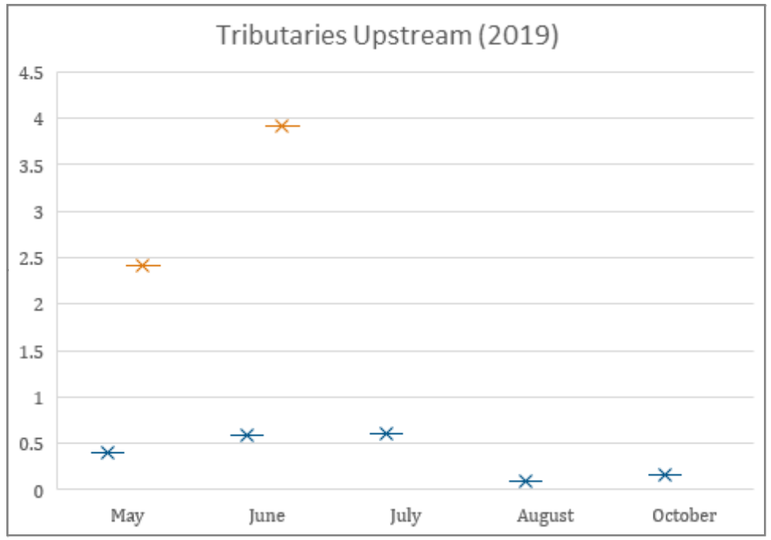

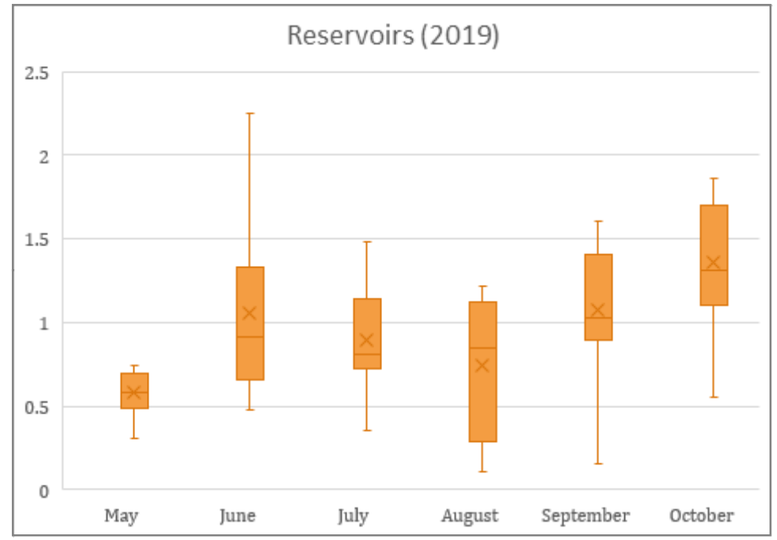

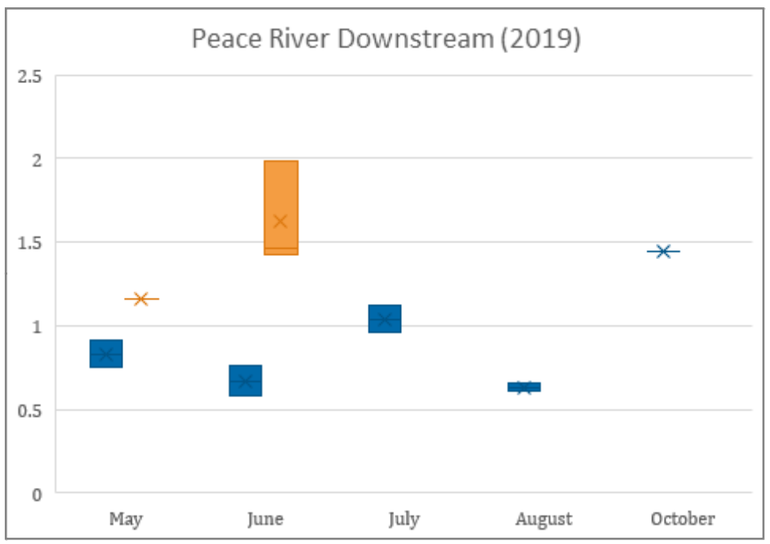

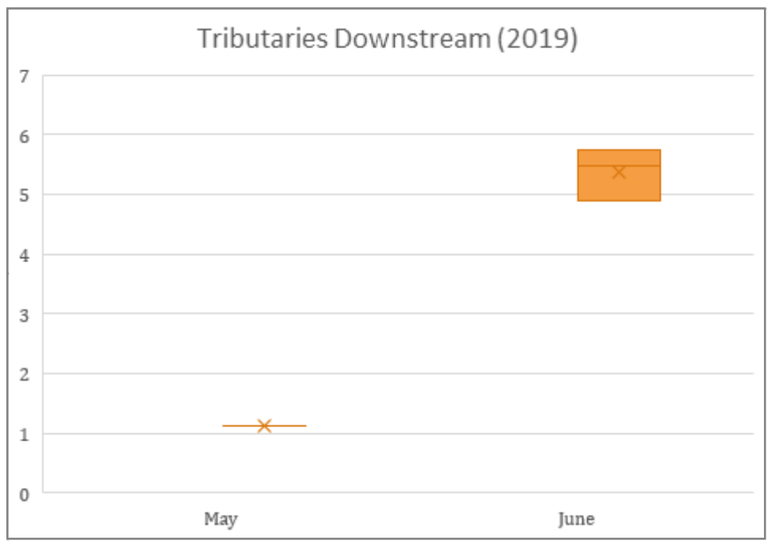

LEGEND

- Pre-Construction
- Construction

STATUS
ISSUED FOR USE

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

Descriptive Analysis of Chlorophyll A

PROJECTION N/A		**DATUM** N/A			**CLIENT** BC hydro
NOTES 1. Y-axis is mg/L 2. Scale of y-axis varies in each panel					
FILE NO. VENW03060-03_Figure03_ChlorophyllA.mxd					TETRA TECH
OFFICE Tt-VANC	**DWN** SL	**CKD** LH	**APVD** SW	**REV** 0	**Figure 3**
DATE January 14, 2020	**PROJECT NO.** ENW.VENW03060-03				

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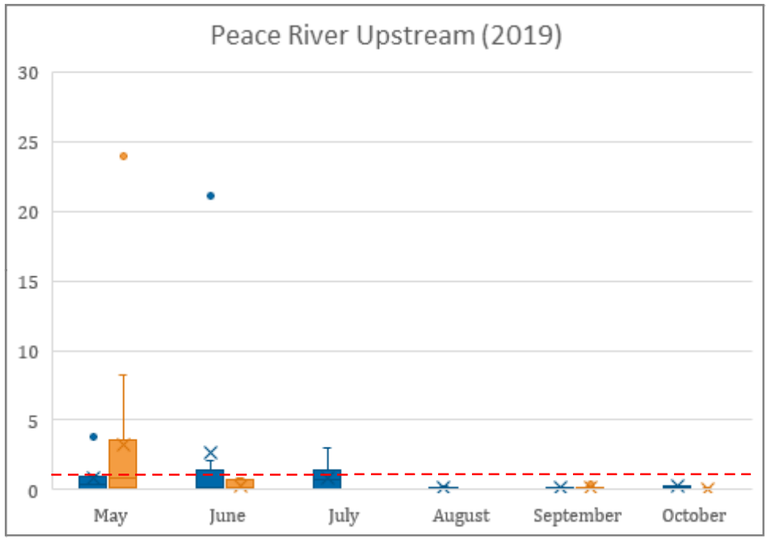

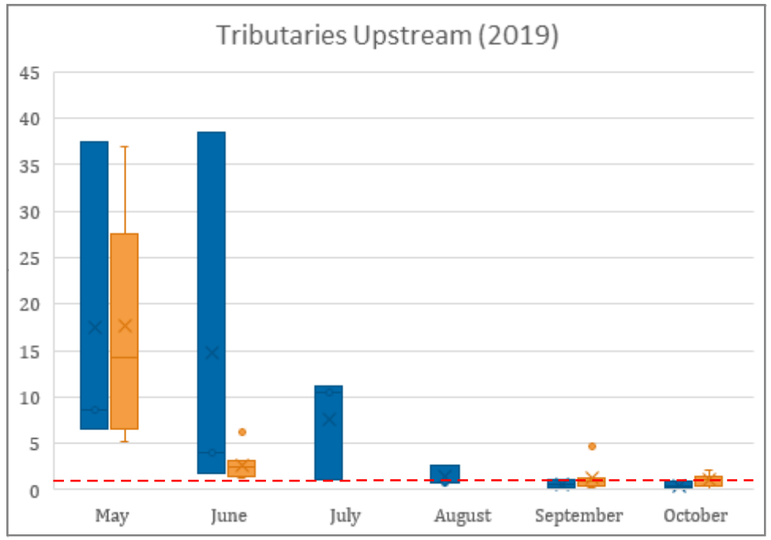

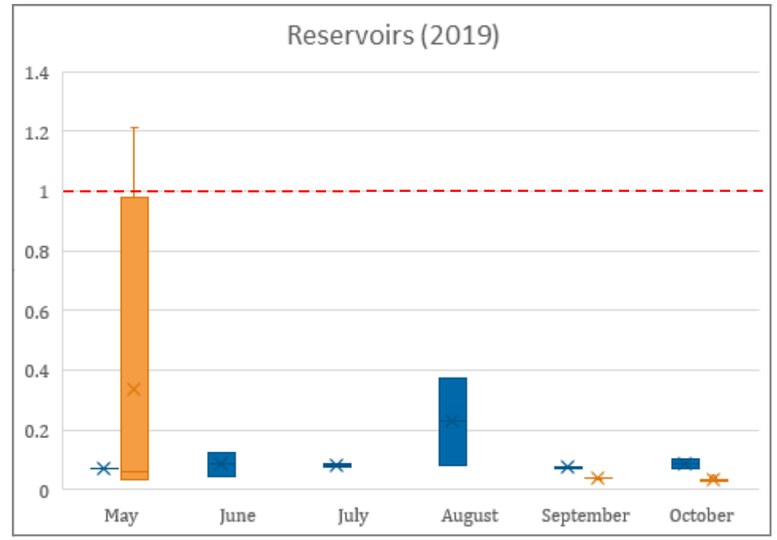

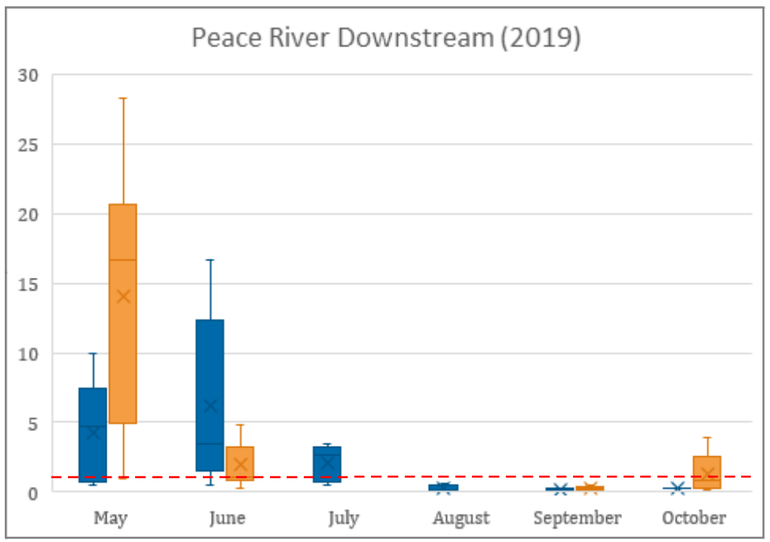

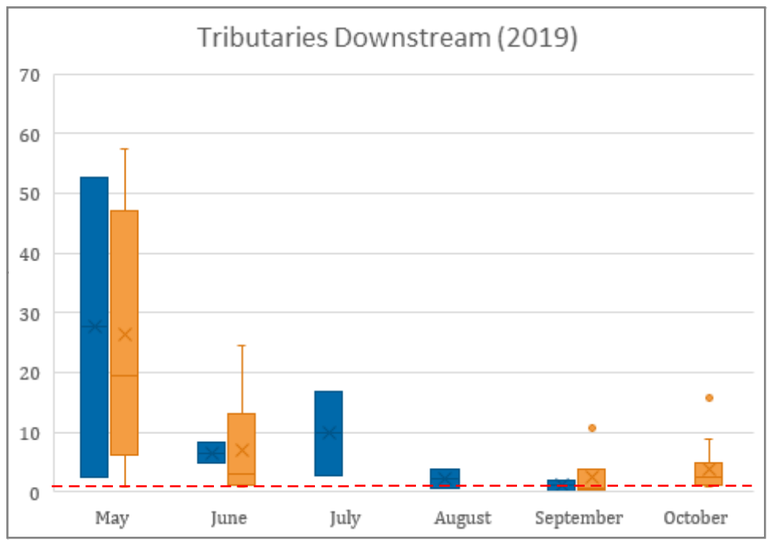

LEGEND

- Pre-Construction
- Construction
- BC AWQG Guideline Limit for Total Iron (1 mg/L)

STATUS
ISSUED FOR USE

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

Descriptive Analysis of Iron

PROJECTION N/A		**DATUM** N/A			**CLIENT** BC hydro
NOTES 1. Y-axis is mg/L 2. Scale of y-axis varies in each panel 3. BC AWQG for total iron = 1 mg/L					TETRA TECH
FILE NO. VENW03060-03_Figure04_Iron.mxd					
OFFICE Tt-VANC	**DWN** SL	**CKD** LH	**APVD** SW	**REV** 0	**Figure 4**
DATE January 14, 2020	**PROJECT NO.** ENW.VENW03060-03				

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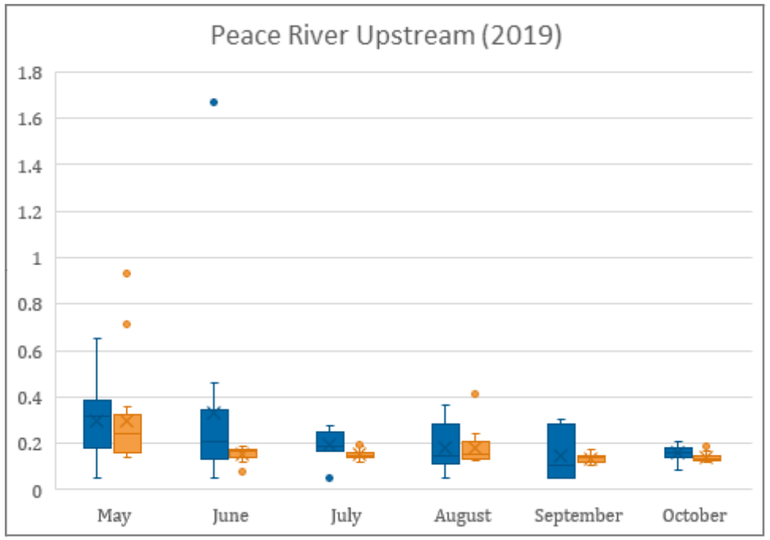
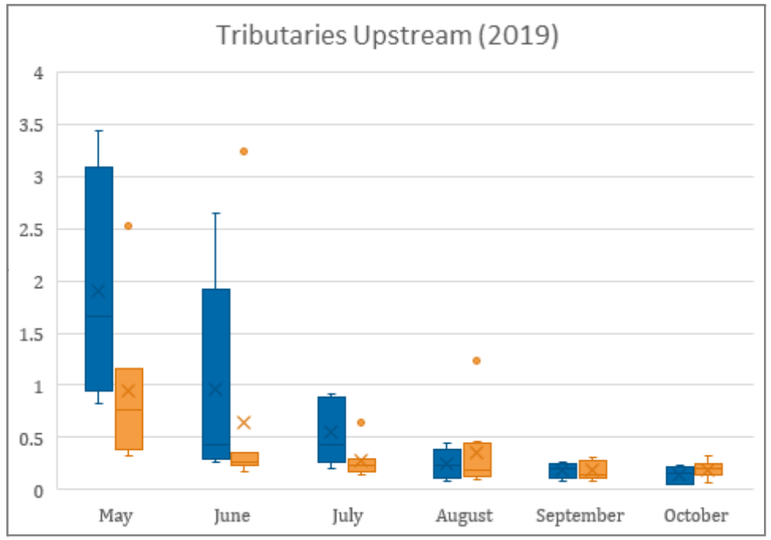
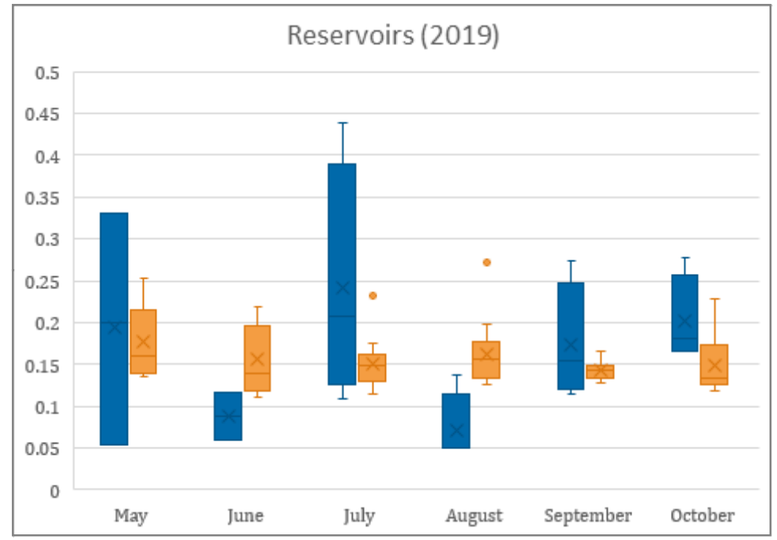
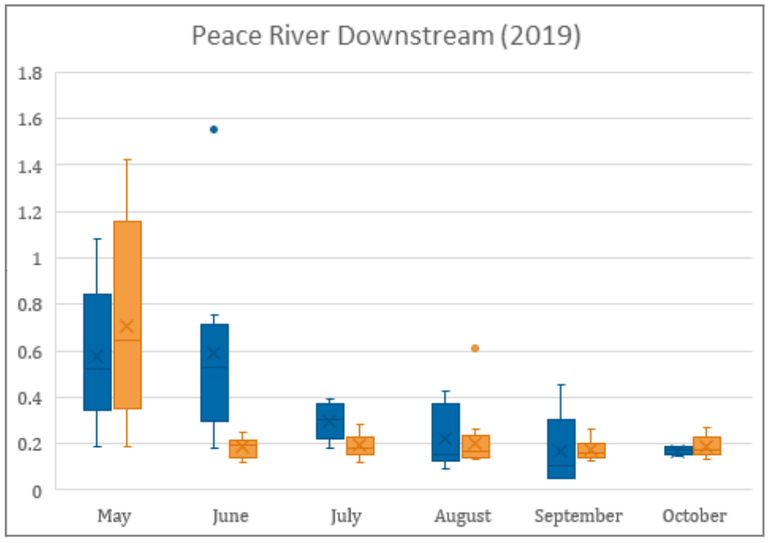
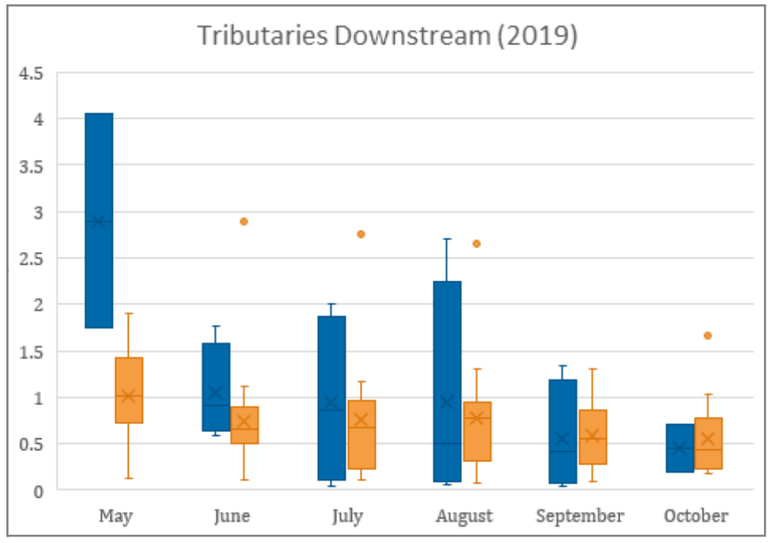










LEGEND

- Pre-Construction
- Construction

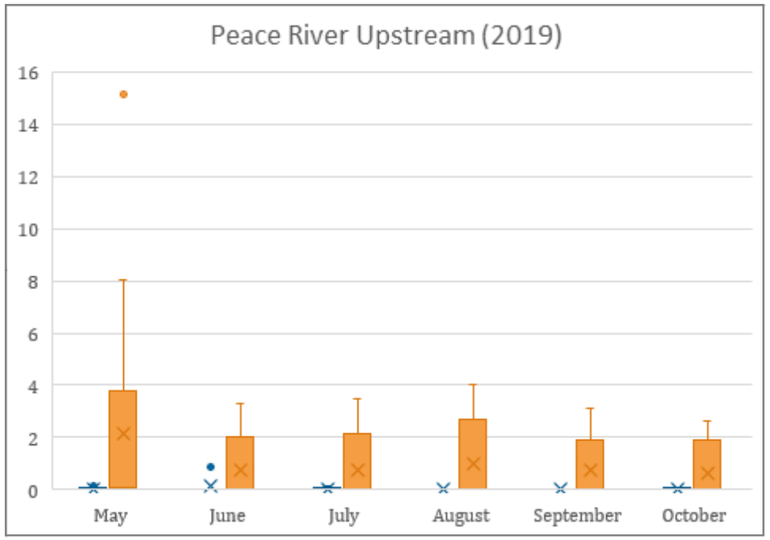
PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

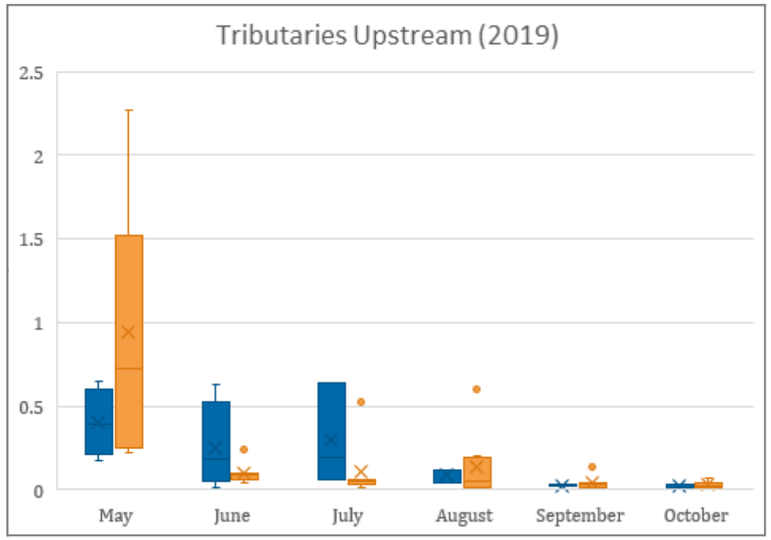
Descriptive Analysis of Nitrogen

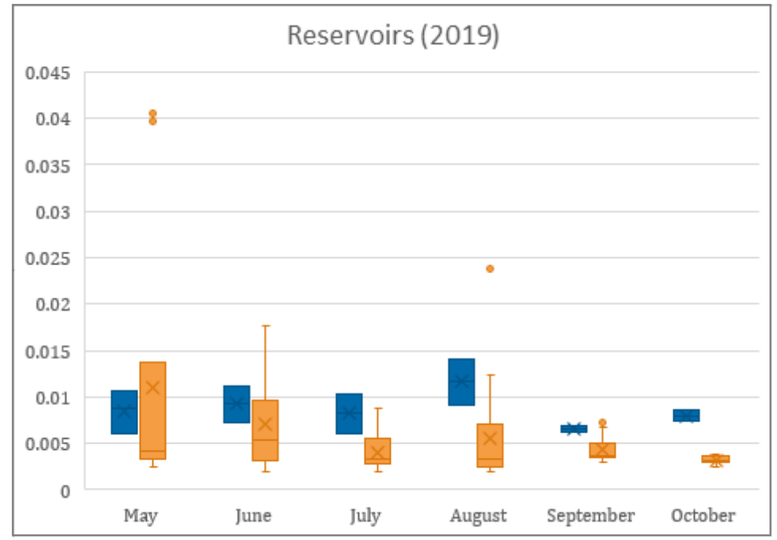
PROJECTION N/A		**DATUM** N/A			**CLIENT** BC hydro
NOTES 1. Y-axis is mg/L 2. Scale of y-axis varies in each panel					TETRA TECH
FILE NO. VENW03060-03_Figure05_Nitrogen.mxd					
OFFICE Tt-VANC	**DWN** SL	**CKD** LH	**APVD** SW	**REV** 0	**Figure 5**
DATE January 14, 2020	**PROJECT NO.** ENW.VENW03060-03				

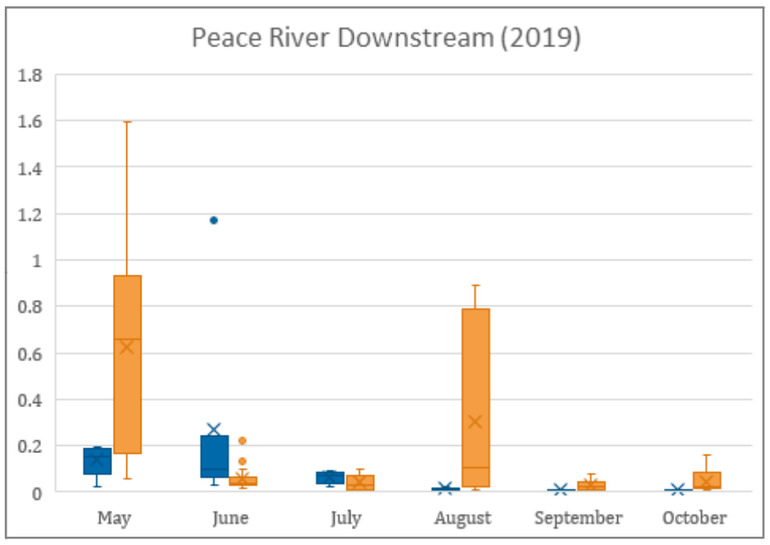
STATUS ISSUED FOR USE

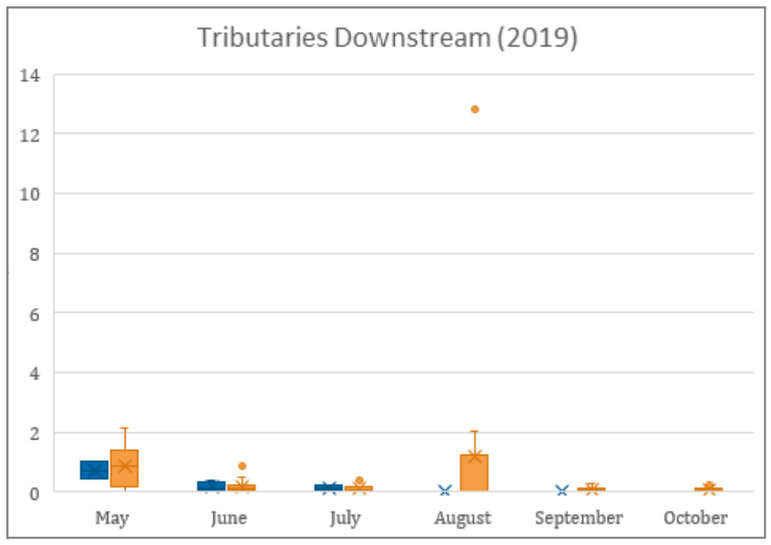
Q:\Vancouver\GIS\ENVIRONMENTAL\VENW\VENW03060-03\Maps\VENW03060-03_Figure05_Nitrogen.mxd modified 1/14/2020 by stephanie.leusink











LEGEND

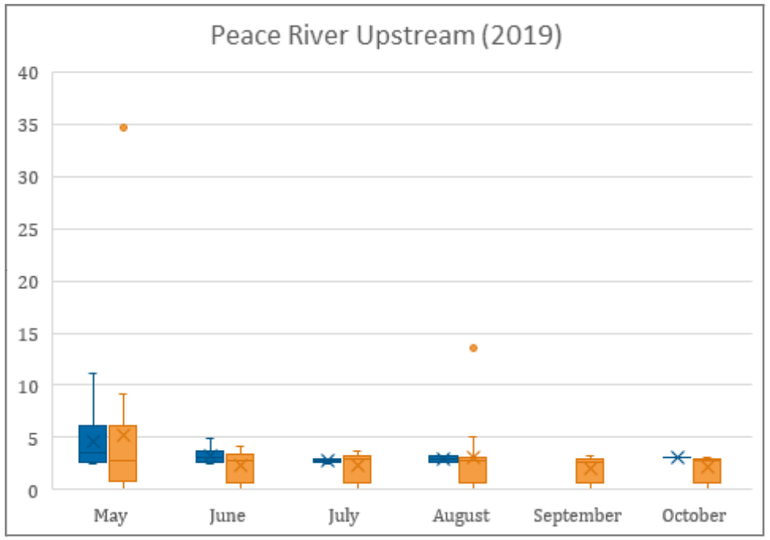
- Pre-Construction
- Construction

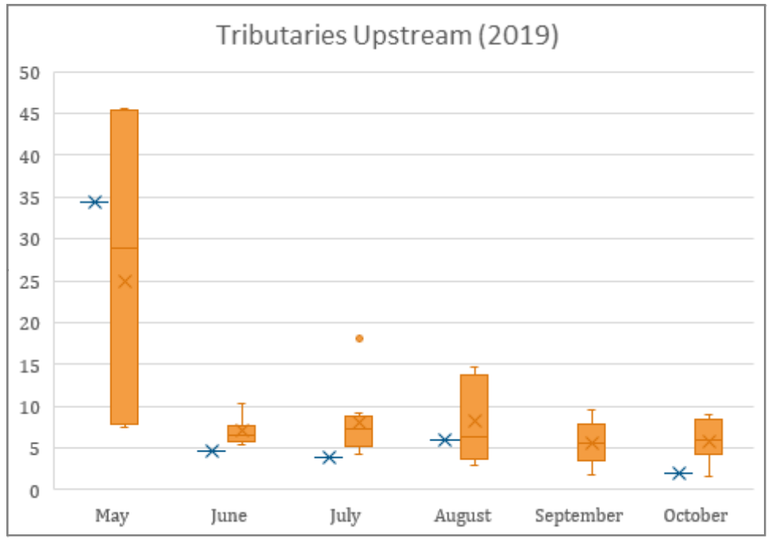
PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

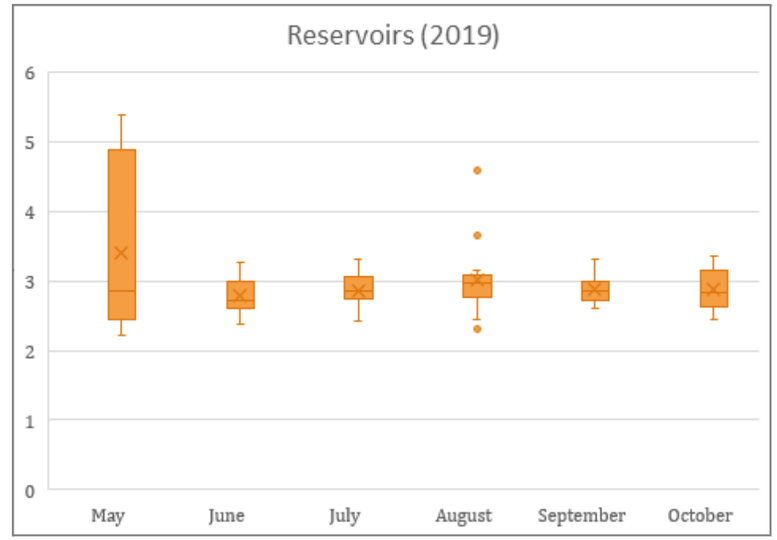
Descriptive Analysis of Phosphorus

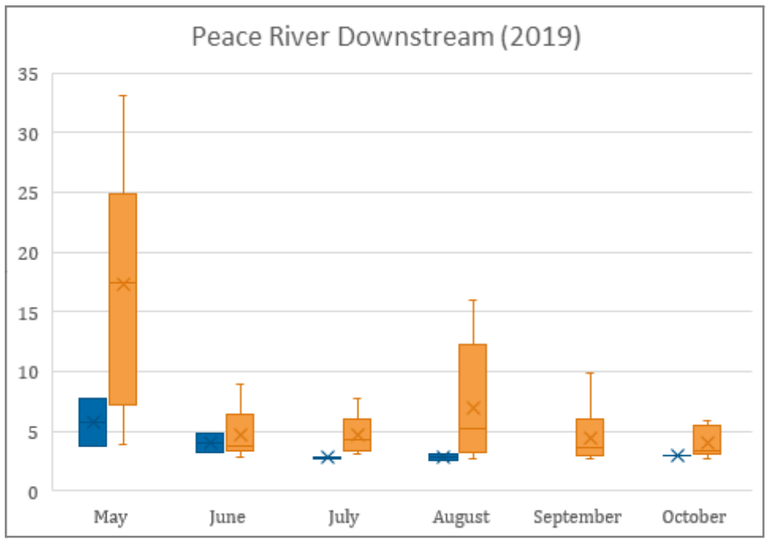
PROJECTION N/A			**DATUM** N/A		**CLIENT** BC hydro
NOTES 1. Y-axis is mg/L 2. Scale of y-axis varies in each panel					TETRA TECH
FILE NO. VENW03060-03_Figure06_Phosphorus.mxd					
OFFICE Tt-VANC	**DWN** SL	**CKD** LH	**APVD** SW	**REV** 0	**Figure 6**
DATE January 14, 2020	**PROJECT NO.** ENW.VENW03060-03				

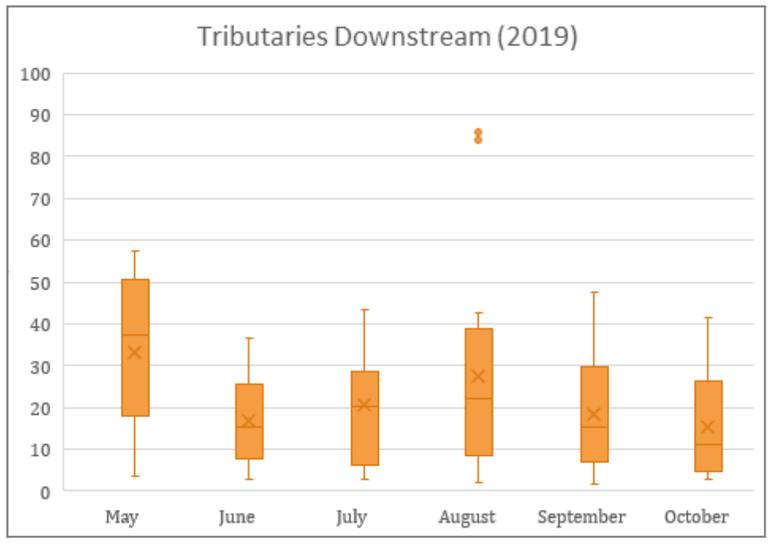
STATUS ISSUED FOR USE











LEGEND

- Pre-Construction
- Construction

STATUS
ISSUED FOR USE

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

Descriptive Analysis of TOC

PROJECTION N/A	**DATUM** N/A	**CLIENT** BC hydro
NOTES 1. Y-axis is mg/L 2. Scale of y-axis varies in each panel		TETRA TECH
FILE NO. VENW03060-03_Figure07_TOC.mxd		
OFFICE Tt-VANC	**DWN** SL / **CKD** LH / **APVD** SW / **REV** 0	**Figure 7**
DATE January 14, 2020	**PROJECT NO.** ENW.VENW03060-03	

APPENDIX A
LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

NATURAL SCIENCES

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of Saulteau EBA Environmental Services Joint Venture's (SEES JV) Client (the "Client") as specifically identified in the SEES JV Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). SEES JV does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by SEES JV.

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1.2 ALTERNATIVE DOCUMENT FORMAT

Where SEES JV submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed SEES JV's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by SEES JV shall be deemed to be the original. SEES JV will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of SEES JV's Instruments of Professional Service shall not, under any circumstances, be altered by any party except SEES JV. SEES JV's Instruments of Professional Service will be used only and exactly as submitted by SEES JV.

Electronic files submitted by SEES JV have been prepared and submitted using specific software and hardware systems. SEES JV makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by SEES JV for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of SEES JV.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with SEES JV with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for SEES JV to properly provide the services contracted for in the Contract, SEES JV has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO SEES JV BY OTHERS

During the performance of the work and the preparation of this Professional Document, SEES JV may have relied on information provided by third parties other than the Client.

While SEES JV endeavours to verify the accuracy of such information, SEES JV accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to SEES JV at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

SEES JV is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL ISSUES

The ability to rely upon and generalize from environmental baseline data is dependent on data collection activities occurring within biologically relevant survey windows.

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design or scope, in consideration of the level of the environmental baseline information that was reasonably acquired to facilitate completion of the scope.

1.8 NOTIFICATION OF AUTHORITIES

SEES JV professionals are bound by their ethical commitments to act within the bounds of all pertinent regulations. In certain instances, observations by SEES JV of regulatory contravention may require that regulatory agencies and other persons be informed. The client agrees that notification to such bodies or persons as required may be done by SEES JV in its reasonably exercised discretion.

APPENDIX B
LABORATORY REPORTS

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 26-MAY-19
Report Date: 07-JUN-19 11:55 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2279324

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2279324-1	L2279324-2	L2279324-3	L2279324-4	L2279324-5
Description	Water	Water	Water	Water	Water
Sampled Date	25-MAY-19	25-MAY-19	25-MAY-19	25-MAY-19	25-MAY-19
Sampled Time	10:20	11:00	13:45	12:30	13:45
Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 2 (DUP 2)
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	0.578	0.533	0.397	0.660	0.372

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2279324-1 Water 25-MAY-19 10:20 WILLISTON SHALLOW (W1 - SHALLOW)	L2279324-2 Water 25-MAY-19 11:00 WILLISTON DEEP (W1 - DEEP)	L2279324-3 Water 25-MAY-19 13:45 DINOSAUR SHALLOW (D1 - SHALLOW)	L2279324-4 Water 25-MAY-19 12:30 DINOSAUR DEEP (D1 - DEEP)	L2279324-5 Water 25-MAY-19 13:45 DUPLICATE 2 (DUP 2)
WATER						
Physical Tests	Colour, True (CU)	6.1	7.0	10.0	10.2	9.9
	Conductivity (uS/cm)	194	195	193	194	193
	Hardness (as CaCO3) (mg/L)	94.5	91.0	93.6	97.4	93.3
	pH (pH)	8.17	8.19	8.18	8.18	8.18
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	TDS (Calculated) (mg/L)	103	102	103	105	103
	Turbidity (NTU)	0.98	1.01	3.17	3.53	3.20
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	86.2	87.8	86.8	87.7	86.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	86.2	87.8	86.8	87.7	86.3
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.033	0.039	0.042	0.043	0.043
	Nitrate and Nitrite (as N) (mg/L)	0.0682	0.0682	0.0756	0.0764	0.0763
	Nitrate (as N) (mg/L)	0.0682	0.0682	0.0756	0.0764	0.0763
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.088	0.095	0.084	0.101	0.094
	Total Nitrogen (mg/L)	0.138	0.143	0.171	0.184	0.166
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0024	0.0029	0.0045	0.0051	0.0046
	Silicate (as SiO2) (mg/L)	5.31	5.31	4.80	5.62	5.66
	Sulfate (SO4) (mg/L)	15.1	14.9	14.3	14.2	14.2
	Anion Sum (meq/L)	2.04	2.07	2.04	2.06	2.03
	Cation Sum (meq/L)	1.89	1.82	1.87	1.95	1.87
	Cation - Anion Balance (%)	-3.9	-6.5	-4.3	-2.7	-4.2
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.52	2.39	2.89	2.89	2.82
	Total Organic Carbon (mg/L)	2.46	2.22	2.78	2.91	2.98
Total Metals	Aluminum (Al)-Total (mg/L)	0.0247	0.0242	0.0519	0.0725	0.0636
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Total (mg/L)	0.032	0.032	0.040	0.039	0.039
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2279324-1 Water 25-MAY-19 10:20 WILLISTON SHALLOW (W1 - SHALLOW)	L2279324-2 Water 25-MAY-19 11:00 WILLISTON DEEP (W1 - DEEP)	L2279324-3 Water 25-MAY-19 13:45 DINOSAUR SHALLOW (D1 - SHALLOW)	L2279324-4 Water 25-MAY-19 12:30 DINOSAUR DEEP (D1 - DEEP)	L2279324-5 Water 25-MAY-19 13:45 DUPLICATE 2 (DUP 2)
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000136	0.0000160	0.0000156	0.0000202	0.0000161
	Calcium (Ca)-Total (mg/L)	27.7	27.3	28.0	29.0	27.1
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Total (mg/L)	0.033	0.034	0.069	0.103	0.084
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.0011	0.0011	0.0014	0.0014	0.0013
	Magnesium (Mg)-Total (mg/L)	6.48	6.41	6.41	6.75	6.53
	Manganese (Mn)-Total (mg/L)	0.00258	0.00262	0.00337	0.00373	0.00341
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Mercury (Hg)-Total (ug/L)	<0.00050	<0.00050	0.00077	0.00084	0.00090
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.000266	0.000281	0.000260	0.000252	0.000251
	Silicon (Si)-Total (mg/L)	2.13	2.16	2.21	2.22	2.30
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	0.112	0.113	0.111	0.103	0.110
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.00051	0.00051	0.00049	0.00047	0.00048
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00061	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050	0.0057	0.0065	0.0055
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Dissolved (mg/L)	0.033	0.035	0.038	0.039	0.038
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2279324-1	L2279324-2	L2279324-3	L2279324-4	L2279324-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-MAY-19	25-MAY-19	25-MAY-19	25-MAY-19	25-MAY-19
	Sampled Time	10:20	11:00	13:45	12:30	13:45
	Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 2 (DUP 2)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.0000083	0.0000099	0.0000101	0.0000088	0.0000080
	Calcium (Ca)-Dissolved (mg/L)	27.6	25.5	26.8	28.1	27.0
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0010	0.0010	0.0013	0.0013	0.0013
	Magnesium (Mg)-Dissolved (mg/L)	6.24	6.64	6.49	6.60	6.32
	Manganese (Mn)-Dissolved (mg/L)	0.00108	0.00110	0.00168	0.00146	0.00157
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Mercury (Hg)-Dissolved (ug/L)	<0.00050	<0.00050	0.00063	0.00064	0.00077
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.000295	0.000234	0.000254	0.000299	0.000230
	Silicon (Si)-Dissolved (mg/L)	2.15	2.11	2.22	2.15	2.11
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Dissolved (mg/L)	0.102	0.0992	0.0950	0.0976	0.103
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00046	0.00046	0.00043	0.00045	0.00046
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Methylmercury (as MeHg)-Total (ug/L)	<0.000020	<0.000020	<0.000020	<0.000020	0.000239

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Barium (Ba)-Total	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2279324-1, -2, -3, -4, -5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2279324-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Reference Information

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-D-U-CVAF-VA Water Diss. Mercury in Water by CVAFS (Ultra) APHA 3030 B / EPA 1631 REV. E

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MEHG-D-GCAF-VA Water Diss. Methylmercury in Water by GCAFS EPA 1630

This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MEHG-T-GCAF-VA Water Total Methylmercury in Water by GCAFS EPA 1630

This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. THe separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Reference Information

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2279324-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Dis...	...ush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2 Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax ebaaccountspayable@tetratech.com	
Company:		Email 2 Lucas.Hennecker@tetratech.com (see notes)	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2279324 **ALS Contact:** Brent Mack **Sampler:** Elyse Hofs

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	P TOC, TN, TP, TDP, TKN, NH3	F/P DOC	P Total Metals (CCME+ICP+Hardness) & Hg	F/P Dissolved Metals (CCME+ICP+Hardness)/H	Total Hg (ultra low detection limit)	F Dissolved Hg (ultra low detection limit)	P Total MeHg (ultra low detection limit)	F/P Dissolved MeHg (ultra low detection limit)	F chlorophyll a (field filtered 250 mL)	Number of Containers
	Williston Shallow (W1 - Shallow)	25 May 19	10:20	Water	R	R	R	R	R	R	R	R	R	R	R	R	12
	Williston Deep (W1 - Deep)		11:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	12
	Dinosaur Shallow (D1 - Shallow)		13:45	Water	R	R	R	R	R	R	R	R	R	R	R	R	12
	Dinosaur Deep (D1 - Deep)		12:30	Water	R	R	R	R	R	R	R	R	R	R	R	R	12
	Duplicate 2 (DUP 2)		13:45	Water	R	R	R	R	R	R	R	R	R	R	R	R	12
	~~Peace Canyon (PC1)~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~		

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. samples were taken from pre-treatment water sources. Please add nich.burnett@bchydro.com to distribution list for results
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☒				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
12					8

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Elyse Hofs	26May19	15:00	Gesh	May 26/19	16:30	HA	5/27	11:31

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 26-MAY-19
Report Date: 07-JUN-19 11:57 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2279325

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2279325-6				
Description	Water				
Sampled Date	26-MAY-19				
Sampled Time	14:00				
Client ID	FIELD BLANK				
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	<0.010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2279325-1 Water 26-MAY-19 11:55 HALFWAY RIVER - DOWNSTREAM (HD)	L2279325-2 Water 26-MAY-19 12:45 MIDDLE SITE C RESERVOIR (PR2)	L2279325-3 Water 26-MAY-19 08:51 PEACE CANYON (PC1)	L2279325-4 Water 26-MAY-19 10:26 UPPER SITE C RESERVOIR (PR1)	L2279325-5 Water 26-MAY-19 12:45 DUPLICATE 1 (DUP 1)
WATER						
Physical Tests	Colour, True (CU)	26.7	10.1	10.0	9.6	10.4
	Conductivity (uS/cm)	315	190	191	187	191
	Hardness (as CaCO3) (mg/L)	160	97.6	93.8	91.3	93.0
	pH (pH)	8.25	8.12	8.11	8.10	8.13
	Total Suspended Solids (mg/L)	465	12.6	<3.0	<3.0	11.6
	TDS (Calculated) (mg/L)	188	107	103	101	105
	Turbidity (NTU)	193	11.1	2.72	2.35	9.51
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	149	88.1	86.2	84.2	88.1
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	149	88.1	86.2	84.2	88.1
	Ammonia, Total (as N) (mg/L)	0.0162	<0.0050	<0.0050	0.0052	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.099	0.046	0.044	0.047	0.048
	Nitrate and Nitrite (as N) (mg/L)	0.0310	0.0674	0.0718	0.0714	0.0679
	Nitrate (as N) (mg/L)	0.0310	0.0674	0.0718	0.0714	0.0679
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.300	0.141	0.090	0.105	0.101
	Total Nitrogen (mg/L)	0.474	0.182	0.167	0.173	0.193
	Orthophosphate-Dissolved (as P) (mg/L)	0.0040	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0063	<0.0020	0.0031	0.0022	<0.0020
	Phosphorus (P)-Total (mg/L)	0.260	0.0133	0.0046	0.0047	0.0143
	Silicate (as SiO2) (mg/L)	4.53	7.13	5.28	5.14	7.22
	Sulfate (SO4) (mg/L)	33.1	15.5	14.9	14.9	15.5
	Anion Sum (meq/L)	3.67	2.09	2.04	2.00	2.09
	Cation Sum (meq/L)	3.31	1.95	1.88	1.83	1.86
	Cation - Anion Balance (%)	-5.3	-3.5	-4.2	-4.6	-5.9
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.25	3.06	2.79	2.76	3.07
	Total Organic Carbon (mg/L)	7.48	3.24	2.77	2.90	3.22
Total Metals	Aluminum (Al)-Total (mg/L)	3.57	0.316	0.0666	0.0652	0.298
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	0.00318	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Total (mg/L)	0.255	0.048	0.039	0.040	0.045
	Beryllium (Be)-Total (mg/L)	0.00024	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2279325-6	L2279325-7			
	Description	Water	Water			
	Sampled Date	26-MAY-19	26-MAY-19			
	Sampled Time	14:00	14:00			
	Client ID	FIELD BLANK	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0			
	Conductivity (uS/cm)	<2.0	<2.0			
	Hardness (as CaCO3) (mg/L)	<0.50	<0.50 HTC			
	pH (pH)	5.55	5.42			
	Total Suspended Solids (mg/L)	<3.0	<3.0			
	TDS (Calculated) (mg/L)	<1.0	<1.0			
	Turbidity (NTU)	<0.10	<0.10			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	<0.020	<0.020			
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	<0.0051			
	Nitrate (as N) (mg/L)	<0.0050	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	<0.050	<0.050			
	Total Nitrogen (mg/L)	<0.030	<0.030			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020			
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020			
	Silicate (as SiO2) (mg/L)	<0.50	<0.50			
	Sulfate (SO4) (mg/L)	<0.30	<0.30			
	Anion Sum (meq/L)	<0.10	<0.10			
	Cation Sum (meq/L)	<0.10	<0.10			
	Cation - Anion Balance (%)	0.0	0.0			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50				
	Total Organic Carbon (mg/L)	<0.50	<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0200 RRV	<0.0050			
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050			
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050			
	Barium (Ba)-Total (mg/L)	<0.020	<0.020			
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2279325-1 Water 26-MAY-19 11:55 HALFWAY RIVER - DOWNSTREAM (HD)	L2279325-2 Water 26-MAY-19 12:45 MIDDLE SITE C RESERVOIR (PR2)	L2279325-3 Water 26-MAY-19 08:51 PEACE CANYON (PC1)	L2279325-4 Water 26-MAY-19 10:26 UPPER SITE C RESERVOIR (PR1)	L2279325-5 Water 26-MAY-19 12:45 DUPLICATE 1 (DUP 1)
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.000498	0.0000432	0.0000155	0.0000159	0.0000393
	Calcium (Ca)-Total (mg/L)	57.4	28.3	27.1	28.5	29.1
	Chromium (Cr)-Total (mg/L)	0.0063	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Total (mg/L)	0.00328	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Total (mg/L)	0.0091	0.0013	<0.0010	<0.0010	0.0012
	Iron (Fe)-Total (mg/L)	7.04	0.381	0.095	0.091	0.391
	Lead (Pb)-Total (mg/L)	0.00388	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.0088	0.0018	0.0014	0.0014	0.0018
	Magnesium (Mg)-Total (mg/L)	17.7	7.83	6.51	6.81	7.10
	Manganese (Mn)-Total (mg/L)	0.124	0.00925	0.00367	0.00349	0.00823
	Mercury (Hg)-Total (mg/L)	0.000027	<0.000025 DLM	<0.0000050	<0.0000050	<0.0000050
	Mercury (Hg)-Total (ug/L)	0.0217	0.00157	0.00083	0.00081	0.00143
	Molybdenum (Mo)-Total (mg/L)	0.0028	<0.0010	0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	0.0124	0.0014	<0.0010	<0.0010	0.0014
	Phosphorus (P)-Total (mg/L)	0.34	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.00160	0.000276	0.000226	0.000254	0.000277
	Silicon (Si)-Total (mg/L)	6.80	2.76	2.23	2.28	2.55
	Silver (Ag)-Total (mg/L)	0.000091	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	2.6	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	0.238	0.106	0.106	0.104	0.109
	Thallium (Tl)-Total (mg/L)	0.000140	0.000012	<0.000010	<0.000010	0.000011
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	0.029	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.00096	0.00049	0.00048	0.00049	0.00049
	Vanadium (V)-Total (mg/L)	0.0169	0.00169	0.00069	0.00065	0.00153
	Zinc (Zn)-Total (mg/L)	0.0432	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0124	<0.0050	0.0235	0.0124	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Dissolved (mg/L)	0.067	0.039	0.038	0.041	0.040
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2279325-6	L2279325-7			
	Description	Water	Water			
	Sampled Date	26-MAY-19	26-MAY-19			
	Sampled Time	14:00	14:00			
	Client ID	FIELD BLANK	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	<0.10	<0.10			
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010			
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030			
	Copper (Cu)-Total (mg/L)	<0.0010	<0.0010			
	Iron (Fe)-Total (mg/L)	<0.030	<0.030			
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050			
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Total (mg/L)	<0.10	<0.10			
	Manganese (Mn)-Total (mg/L)	0.00096 RRV	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Mercury (Hg)-Total (ug/L)	<0.00050	<0.00050			
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010			
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30			
	Potassium (K)-Total (mg/L)	<2.0	<2.0			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	<0.10	<0.10			
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020			
	Sodium (Na)-Total (mg/L)	<2.0	<2.0			
	Strontium (Sr)-Total (mg/L)	<0.0050	<0.0050			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050			
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010			
	Uranium (U)-Total (mg/L)	<0.00020	<0.00020			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050			
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD				
	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	<0.0050				
	Antimony (Sb)-Dissolved (mg/L)	<0.00050				
	Arsenic (As)-Dissolved (mg/L)	<0.00050				
	Barium (Ba)-Dissolved (mg/L)	<0.020				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.20				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2279325-1 Water 26-MAY-19 11:55 HALFWAY RIVER - DOWNSTREAM (HD)	L2279325-2 Water 26-MAY-19 12:45 MIDDLE SITE C RESERVOIR (PR2)	L2279325-3 Water 26-MAY-19 08:51 PEACE CANYON (PC1)	L2279325-4 Water 26-MAY-19 10:26 UPPER SITE C RESERVOIR (PR1)	L2279325-5 Water 26-MAY-19 12:45 DUPLICATE 1 (DUP 1)
WATER						
Dissolved Metals	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.0000198	0.0000103	0.0000121	0.0000101	0.0000087
	Calcium (Ca)-Dissolved (mg/L)	42.4	27.7	26.7	26.1	26.1
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0047	0.0015	0.0013	0.0013	0.0015
	Magnesium (Mg)-Dissolved (mg/L)	13.2	6.88	6.57	6.34	6.77
	Manganese (Mn)-Dissolved (mg/L)	0.0102	0.00148	0.00193	0.00165	0.00147
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Mercury (Hg)-Dissolved (ug/L)	0.00127	0.00073	0.00066	0.00067	0.00068
	Molybdenum (Mo)-Dissolved (mg/L)	0.0028	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	0.0019	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.00134	0.000293	0.000229	0.000264	0.000335
	Silicon (Si)-Dissolved (mg/L)	1.73	1.99	2.06	2.11	1.95
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	2.4	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Dissolved (mg/L)	0.208	0.105	0.105	0.0947	0.108
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00062	0.00047	0.00048	0.00045	0.00049
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000028	<0.000020	<0.000020	<0.000020	<0.000020
	Methylmercury (as MeHg)-Total (ug/L)	<0.000020	0.000023	<0.000020	0.000022	0.000023

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2279325-6	L2279325-7			
	Description	Water	Water			
	Sampled Date	26-MAY-19	26-MAY-19			
	Sampled Time	14:00	14:00			
	Client ID	FIELD BLANK	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Boron (B)-Dissolved (mg/L)	<0.10				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	<0.10				
	Chromium (Cr)-Dissolved (mg/L)	<0.0010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00030				
	Copper (Cu)-Dissolved (mg/L)	<0.0010				
	Iron (Fe)-Dissolved (mg/L)	<0.030				
	Lead (Pb)-Dissolved (mg/L)	<0.00050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	<0.10				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Mercury (Hg)-Dissolved (ug/L)	<0.00050				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010				
	Nickel (Ni)-Dissolved (mg/L)	<0.0010				
	Phosphorus (P)-Dissolved (mg/L)	<0.30				
	Potassium (K)-Dissolved (mg/L)	<2.0				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	<0.050				
	Silver (Ag)-Dissolved (mg/L)	<0.000020				
	Sodium (Na)-Dissolved (mg/L)	<2.0				
	Strontium (Sr)-Dissolved (mg/L)	<0.0050				
	Thallium (Tl)-Dissolved (mg/L)	<0.00020				
	Tin (Sn)-Dissolved (mg/L)	<0.00050				
	Titanium (Ti)-Dissolved (mg/L)	<0.010				
	Uranium (U)-Dissolved (mg/L)	<0.00020				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0050				
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	<0.000020				
	Methylmercury (as MeHg)-Total (ug/L)	<0.000020	<0.000020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2279325-1, -2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2279325-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2279325-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2279325-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2279325-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2279325-1, -2, -3, -4, -5, -6
Matrix Spike	Aluminum (Al)-Total	MS-B	L2279325-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L2279325-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L2279325-6, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2279325-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2279325-6, -7
Matrix Spike	Iron (Fe)-Total	MS-B	L2279325-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2279325-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2279325-6, -7
Matrix Spike	Manganese (Mn)-Total	MS-B	L2279325-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Total	MS-B	L2279325-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Total	MS-B	L2279325-6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2279325-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2279325-6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.

Reference Information

Concurrent measurement of sample pH is recommended.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-D-U-CVAF-VA Water Diss. Mercury in Water by CVAFS (Ultra) APHA 3030 B / EPA 1631 REV. E

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MEHG-D-GCAF-VA Water Diss. Methylmercury in Water by GCAFS EPA 1630

This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MEHG-T-GCAF-VA Water Total Methylmercury in Water by GCAFS EPA 1630

This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. THe separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

Reference Information

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location

Reference Information

VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2279325-COFC

COC Number: 14 -

Report To	
Company:	Tetra Tech Canada Inc.
Contact:	Lucas Hennecker
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5
Phone:	1 (604) 313-9067

Report Format / Distribution

- Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
- Quality Control (QC) Report with Report ☑ Yes ☐ No
- ☑ Criteria on Report - provide details below if box checked
- Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
- Email 1 or Fax: Lucas.Hennecker@tetratech.com (see notes)
- Email 2: Brent.Finnestad@tetratech.com

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

- R ☑ Regular (Standard TAT if received by 3 pm - business days)
- P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
- E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
- E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
- Specify Date Required for E2,E or P:

Invoice To

- Same as Report To ☑ Yes ☐ No
- Copy of Invoice with Report ☑ Yes ☐ No
- Company:
- Contact:

Invoice Distribution

- Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
- Email 1 or Fax: ebaaccountspayable@tetratech.com
- Email 2: Lucas.Hennecker@tetratech.com (see notes)

Project Information

ALS Quote #:	Q53931
Job #:	VENW03060-03.002
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

Approver ID:	Cost Center:
GL Account:	Routing Code:
Activity Code:	
Location:	

ALS Lab Work Order # (lab use only): L2279325

ALS Contact: Brent Mack | Sampler: Elyse Hofs

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate. Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/H (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)	~~Total Coliform, E. coli, HPC~~ chlorophyll a field filtered 250mL (~~F~~)	~~Dissolved Ferrous Iron~~ (~~F/P~~)	Number of Containers
	Halfway River - Downstream (HD)	26May19	11:55	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Middle Site C Reservoir (PR2)	↓	12:45	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Peace Canyon (PC1)	↓	8:51	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Upper Site C Reservoir (PR1)	↓	10:26	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Duplicate 1 (DUP 1)	↓	12:45	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Field Blank	↓	14:00	Water	R	R	R	R	R	R	R	R	R	R	R	R		12
	Trip Blank	↓	14:00	Water	R	R	R	R	R	R	R	R	R	R	R			11

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. samples were taken from pre-treatment water sources. Please addand nich.burnett@bchydro.com to distribution list for results

SAMPLE CONDITION AS RECEIVED (lab use only)

- Frozen ☐ SIF Observations Yes ☐ No ☐
- Ice packs Yes ☑ No ☐ Custody seal intact Yes ☐ No ☐
- Cooling Initiated ☑
- INITIAL COOLER TEMPERATURES °C: 14
- FINAL COOLER TEMPERATURES °C: 8

SHIPMENT RELEASE (client use)	INITIAL SHIPMENT RECEPTION (lab use only)	FINAL SHIPMENT RECEPTION (lab use only)
Released by: Elyse Hofs Date: 26May19 Time: 15:00	Received by: Geoff Date: May26/19 Time: 16:30	Received by: HA Date: 5/27 Time: 11:31 am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 23-MAY-19
Report Date: 06-JUN-19 17:08 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2279149

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2279149-1 Water 23-MAY-19 15:06 MOBERLY RIVER - DOWNSTREAM (MD)	L2279149-2 Water 23-MAY-19 14:25 LOWER SITE C RESERVOIR (PR3)	L2279149-3 Water 23-MAY-19 15:54 PEACE AT PINE (PD1)	L2279149-4 Water 23-MAY-19 16:24 PINE RIVER (PINE)	
WATER						
Physical Tests	Colour, True (CU)	30.4	20.8	21.6	19.8	
	Conductivity (uS/cm)	215	235	228	206	
	Hardness (as CaCO3) (mg/L)	110	124	125	110	
	pH (pH)	8.26	8.26	8.19	8.25	
	Total Suspended Solids (mg/L)	299	75.4	92.4	274	
	TDS (Calculated) (mg/L)	123	138	135	116	
	Turbidity (NTU)	219	67.4	79.1	179	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	108	107	108	104	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	108	107	108	104	
	Ammonia, Total (as N) (mg/L)	0.0135	0.0175	0.0127	0.0110	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.079	0.064	0.065	0.055	
	Nitrate and Nitrite (as N) (mg/L)	0.104	0.0567	0.0624	0.106	
	Nitrate (as N) (mg/L)	0.104	0.0567	0.0624	0.106	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.297	0.287	0.369	0.421	
	Total Nitrogen (mg/L)	0.331	0.251	0.312	0.380	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0018	<0.0010	0.0012	0.0022	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0043	0.0040	0.0378	0.0036	
	Phosphorus (P)-Total (mg/L)	0.219	0.0913	0.097	0.176	
	Silicate (as SiO2) (mg/L)	3.47	4.33	4.08	3.16	
	Sulfate (SO4) (mg/L)	8.94	20.9	19.6	8.69	
	Anion Sum (meq/L)	2.35	2.59	2.57	2.27	
	Cation Sum (meq/L)	2.29	2.58	2.54	2.19	
	Cation - Anion Balance (%)	-1.1	-0.2	-0.4	-1.8	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	8.05	5.41	5.58	4.50	
	Total Organic Carbon (mg/L)	8.88	6.20	5.36	4.72	
Total Metals	Aluminum (Al)-Total (mg/L)	3.23	1.34	1.66	2.75	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	0.00267	0.00113	0.00137	0.00215	
	Barium (Ba)-Total (mg/L)	0.280	0.095	0.116	0.173	
	Beryllium (Be)-Total (mg/L)	0.00023	<0.00010	0.00010	0.00016	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2279149-1	L2279149-2	L2279149-3	L2279149-4	
	Description	Water	Water	Water	Water	
	Sampled Date	23-MAY-19	23-MAY-19	23-MAY-19	23-MAY-19	
	Sampled Time	15:06	14:25	15:54	16:24	
	Client ID	MOBERLY RIVER - DOWNSTREAM (MD)	LOWER SITE C RESERVOIR (PR3)	PEACE AT PINE (PD1)	PINE RIVER (PINE)	
Grouping	**Analyte**					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.000246	0.000144	0.000156	0.000226	
	Calcium (Ca)-Total (mg/L)	35.6	36.0	35.3	36.0	
	Chromium (Cr)-Total (mg/L)	0.0057	0.0025	0.0029	0.0046	
	Cobalt (Co)-Total (mg/L)	0.00264	0.00090	0.00111	0.00219	
	Copper (Cu)-Total (mg/L)	0.0083	0.0033	0.0041	0.0058	
	Iron (Fe)-Total (mg/L)	6.50	2.07	2.70	5.42	
	Lead (Pb)-Total (mg/L)	0.00343	0.00111	0.00147	0.00285	
	Lithium (Li)-Total (mg/L)	0.0069	0.0039	0.0043	0.0067	
	Magnesium (Mg)-Total (mg/L)	10.1	9.74	9.57	8.94	
	Manganese (Mn)-Total (mg/L)	0.113	0.0346	0.0448	0.0944	
	Mercury (Hg)-Total (mg/L)	<0.000025 DLM	<0.000025 DLM	<0.000025 DLM	<0.000025 DLM	
	Mercury (Hg)-Total (ug/L)	0.0189	0.0075	0.0080	0.0165	
	Molybdenum (Mo)-Total (mg/L)	<0.0010	0.0018	0.0014	<0.0010	
	Nickel (Ni)-Total (mg/L)	0.0106	0.0042	0.0051	0.0077	
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Total (mg/L)	0.000448	0.000611	0.000625	0.000588	
	Silicon (Si)-Total (mg/L)	6.39	3.96	4.42	5.02	
	Silver (Ag)-Total (mg/L)	0.000077	0.000026	0.000033	0.000049	
	Sodium (Na)-Total (mg/L)	2.1	2.1	2.1	<2.0	
	Strontium (Sr)-Total (mg/L)	0.0876	0.144	0.135	0.104	
	Thallium (Tl)-Total (mg/L)	0.000089	0.000049	0.000058	0.000080	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Total (mg/L)	0.026	0.016	0.019	0.016	
	Uranium (U)-Total (mg/L)	0.00047	0.00060	0.00062	0.00040	
	Vanadium (V)-Total (mg/L)	0.0121	0.00624	0.00709	0.0105	
	Zinc (Zn)-Total (mg/L)	0.0316	0.0128	0.0151	0.0262	
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0072	0.0127	0.179	0.0110	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	0.115	0.047	0.070	0.062	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2279149-1 Water 23-MAY-19 15:06 MOBERLY RIVER - DOWNSTREAM (MD)	L2279149-2 Water 23-MAY-19 14:25 LOWER SITE C RESERVOIR (PR3)	L2279149-3 Water 23-MAY-19 15:54 PEACE AT PINE (PD1)	L2279149-4 Water 23-MAY-19 16:24 PINE RIVER (PINE)	
WATER						
Dissolved Metals	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Dissolved (mg/L)	0.0000117	0.0000189	0.0000691	0.0000121	
	Calcium (Ca)-Dissolved (mg/L)	29.8	34.5	35.4	31.7	
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	0.00030	<0.00030	
	Copper (Cu)-Dissolved (mg/L)	0.0014	0.0011	0.0017	<0.0010	
	Iron (Fe)-Dissolved (mg/L)	0.046	<0.030	0.378	<0.030	
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Lithium (Li)-Dissolved (mg/L)	0.0031	0.0027	0.0029	0.0029	
	Magnesium (Mg)-Dissolved (mg/L)	8.68	9.25	8.94	7.41	
	Manganese (Mn)-Dissolved (mg/L)	0.00638	0.00394	0.0163	0.00395	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Mercury (Hg)-Dissolved (ug/L)	0.00162	0.00133	0.00432	0.00157	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	0.0014	<0.0010	<0.0010	
	Nickel (Ni)-Dissolved (mg/L)	0.0017	0.0014	0.0021	<0.0010	
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Dissolved (mg/L)	0.000228	0.000494	0.000423	0.000390	
	Silicon (Si)-Dissolved (mg/L)	1.73	2.01	2.18	1.29	
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Dissolved (mg/L)	2.0	2.1	<2.0	<2.0	
	Strontium (Sr)-Dissolved (mg/L)	0.0729	0.142	0.134	0.0946	
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Dissolved (mg/L)	0.00023	0.00048	0.00049	0.00022	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	0.00098	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000064	<0.000080 DLIS	0.000048	<0.000020	
	Methylmercury (as MeHg)-Total (ug/L)	0.000158	0.000052	0.000062	0.000102	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Methylmercury (as MeHg)-Dissolved	B	L2279149-4
Method Blank	Selenium (Se)-Total	MB-LOR	L2279149-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Total	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2279149-1, -2, -3, -4
Matrix Spike	Total Nitrogen	MS-B	L2279149-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLIS	Detection Limit Adjusted: Insufficient Sample
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-D-U-CVAF-VA Water Diss. Mercury in Water by CVAFS (Ultra) APHA 3030 B / EPA 1631 REV. E

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MEHG-D-GCAF-VA Water Diss. Methylmercury in Water by GCAFS EPA 1630

This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MEHG-T-GCAF-VA Water Total Methylmercury in Water by GCAFS EPA 1630

This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. THe separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2279149-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)		R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No		P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX		E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax: Lucas.Hennecker@tetratech.com (see notes)		Specify Date Required for E2,E or P:
		Email 2: Brent.Finnestad@tetratech.com		

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax: ebaaccountspayable@tetratech.com	
Company:		Email 2: Lucas.Hennecker@tetratech.com (see notes)	
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2279149 **ALS Contact:** Brent Mack **Sampler:** Elyse Hofs

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/H (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)	Total Coliform, E. coli, HPC (P)	Dissolved Ferrous Iron (F/P)	Number of Containers
	Moberly River - Downstream (MD)	23 May 19	15:06	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Lower Site C Reservoir (PR3)		14:25	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Peace at Pine (PD1)		15:54	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Pine River (Pine)		16:24	Water	R	R	R	R	R	R	R	R	R	R	R			11

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. samples were taken from pre-treatment water sources. Please and nich.burnett@bchydro.com to distribution list for results

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☒ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☒

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
10			5°C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Elyse Hofs	Date: 23May19	Time: 17:37	Received by: Geoff	Date: May 23/19	Time: 17:37	Received by:	Date: May 25	Time: 11:25a

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS FM-02256 v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

2019

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 24-MAY-19
Report Date: 07-JUN-19 17:31 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2279150

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2279150-1 Water 24-MAY-19 08:05 PEACE AT BEATTON (PD2)	L2279150-2 Water 24-MAY-19 08:30 BEATTON RIVER (BEA)	L2279150-3 Water 24-MAY-19 09:26 PEACE AT KISKATINAW (PD3)	L2279150-4 Water 24-MAY-19 09:53 KISKATINAW RIVER (KR)	L2279150-5 Water 24-MAY-19 10:55 PEACE AT POUCE COUPE (PD4)
WATER						
Physical Tests	Colour, True (CU)	19.7	142	19.2	45.0	23.4
	Conductivity (uS/cm)	214	136	213	284	217
	Hardness (as CaCO3) (mg/L)	115	58.4	115	149	115
	pH (pH)	8.15	7.69	8.15	8.30	8.16
	Total Suspended Solids (mg/L)	225	181	206	473	218
	TDS (Calculated) (mg/L)	126	99.0	127	182	126
	Turbidity (NTU)	152	237	149	554	159
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	109	42.6	110	159	109
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	1.8	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	109	42.6	110	161	109
	Ammonia, Total (as N) (mg/L)	0.0095	0.0157	0.0102	0.0400	0.0108
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	0.57	<0.50	0.83	<0.50
	Fluoride (F) (mg/L)	0.057	0.074	0.056	0.078	0.058
	Nitrate and Nitrite (as N) (mg/L)	0.0921	<0.0051	0.0932	0.0509	0.0862
	Nitrate (as N) (mg/L)	0.0921	<0.0050	0.0932	0.0480	0.0862
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0029	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.173	0.546	0.452	0.699	0.195
	Total Nitrogen (mg/L)	0.352	0.878	0.28 RRV	0.703	0.367
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	0.0013	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0034	0.0762	0.0041	0.0089	0.0040
	Phosphorus (P)-Total (mg/L)	0.164	0.171	0.178	0.387	0.165
	Silicate (as SiO2) (mg/L)	3.77	5.85	3.52	5.22	3.83
	Sulfate (SO4) (mg/L)	12.0	21.6	11.8	10.6	13.1
	Anion Sum (meq/L)	2.43	1.32	2.45	3.46	2.46
	Cation Sum (meq/L)	2.31	1.57	2.29	3.21	2.29
	Cation - Anion Balance (%)	-2.5	8.4	-3.4	-3.8	-3.5
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.78	24.0	4.90	13.2	5.70
	Total Organic Carbon (mg/L)	6.93	22.8	7.95	16.1	6.69
Total Metals	Aluminum (Al)-Total (mg/L)	2.62	3.37	2.61	5.14	2.60
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	0.00205	0.00317	0.00205	0.00419	0.00216
	Barium (Ba)-Total (mg/L)	0.168	0.149	0.160	0.297	0.162
	Beryllium (Be)-Total (mg/L)	0.00018	0.00027	0.00016	0.00041	0.00017
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2279150-6	L2279150-7			
	Description	Water	Water			
	Sampled Date	24-MAY-19	24-MAY-19			
	Sampled Time	12:25	13:03			
	Client ID	POUCE COUPE (POUCE)	PEACE AT MANY ISLANDS (PD5)			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	80.3	26.5			
	Conductivity (uS/cm)	330	216			
	Hardness (as CaCO3) (mg/L)	148	115			
	pH (pH)	8.13	8.16			
	Total Suspended Solids (mg/L)	200	187			
	TDS (Calculated) (mg/L)	221	131			
	Turbidity (NTU)	198	135			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	106	106			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	106	106			
	Ammonia, Total (as N) (mg/L)	0.0403	0.0081			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	3.63	<0.50			
	Fluoride (F) (mg/L)	0.102	0.058			
	Nitrate and Nitrite (as N) (mg/L)	0.0549	0.0830			
	Nitrate (as N) (mg/L)	0.0448	0.0830			
	Nitrite (as N) (mg/L)	0.0101	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	1.46	0.449			
	Total Nitrogen (mg/L)	1.04 RRV	0.356			
	Orthophosphate-Dissolved (as P) (mg/L)	0.0035	0.0014			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0165	0.0154			
	Phosphorus (P)-Total (mg/L)	0.168	0.169			
	Silicate (as SiO2) (mg/L)	3.14	4.05			
	Sulfate (SO4) (mg/L)	58.9	14.5			
	Anion Sum (meq/L)	3.45	2.43			
	Cation Sum (meq/L)	3.57	2.42			
	Cation - Anion Balance (%)	1.7	-0.2			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	22.3	6.14			
	Total Organic Carbon (mg/L)	27.2	8.93			
Total Metals	Aluminum (Al)-Total (mg/L)	2.47	2.43			
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050			
	Arsenic (As)-Total (mg/L)	0.00333	0.00205			
	Barium (Ba)-Total (mg/L)	0.126	0.147			
	Beryllium (Be)-Total (mg/L)	0.00019	0.00016			
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2279150-1	L2279150-2	L2279150-3	L2279150-4	L2279150-5
Description	Water	Water	Water	Water	Water
Sampled Date	24-MAY-19	24-MAY-19	24-MAY-19	24-MAY-19	24-MAY-19
Sampled Time	08:05	08:30	09:26	09:53	10:55
Client ID	PEACE AT BEATTON (PD2)	BEATTON RIVER (BEA)	PEACE AT KISKATINAW (PD3)	KISKATINAW RIVER (KR)	PEACE AT POUCE COUPE (PD4)
Grouping / **Analyte**					
WATER					
Total Metals Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium (Cd)-Total (mg/L)	0.000201	0.000175	0.000183	0.000479	0.000233
Calcium (Ca)-Total (mg/L)	35.4	16.2	35.3	57.2	36.4
Chromium (Cr)-Total (mg/L)	0.0044	0.0061	0.0044	0.0083	0.0045
Cobalt (Co)-Total (mg/L)	0.00203	0.00280	0.00194	0.00460	0.00203
Copper (Cu)-Total (mg/L)	0.0055	0.0111	0.0056	0.0143	0.0060
Iron (Fe)-Total (mg/L)	4.95	6.87	4.97	10.0	4.96
Lead (Pb)-Total (mg/L)	0.00264	0.00365	0.00263	0.00620	0.00270
Lithium (Li)-Total (mg/L)	0.0060	0.0076	0.0060	0.0089	0.0060
Magnesium (Mg)-Total (mg/L)	9.54	5.43	9.14	14.9	9.58
Manganese (Mn)-Total (mg/L)	0.0849	0.0714	0.0829	0.186	0.0833
Mercury (Hg)-Total (mg/L)	<0.000025 DLM	0.000030	<0.000025 DLM	<0.000025 DLM	<0.000025 DLM
Mercury (Hg)-Total (ug/L)	0.0112	0.0219	0.0188	0.0218	0.0150
Molybdenum (Mo)-Total (mg/L)	0.0010	<0.0010	0.0010	<0.0010	0.0013
Nickel (Ni)-Total (mg/L)	0.0074	0.0129	0.0073	0.0161	0.0079
Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	0.43	<0.30
Potassium (K)-Total (mg/L)	<2.0	2.2	<2.0	2.6	<2.0
Selenium (Se)-Total (mg/L)	0.000598	0.000528	0.000502	0.000455	0.000585
Silicon (Si)-Total (mg/L)	4.97	7.24	5.06	9.64	5.25
Silver (Ag)-Total (mg/L)	0.000047	0.000090	0.000048	0.000092	0.000054
Sodium (Na)-Total (mg/L)	<2.0	6.8	<2.0	5.5	2.1
Strontium (Sr)-Total (mg/L)	0.119	0.0682	0.116	0.195	0.121
Thallium (Tl)-Total (mg/L)	0.000079	0.000092	0.000078	0.000142	0.000079
Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Titanium (Ti)-Total (mg/L)	0.019	0.016	0.018	0.030	0.018
Uranium (U)-Total (mg/L)	0.00049	0.00055	0.00046	0.00085	0.00052
Vanadium (V)-Total (mg/L)	0.0101	0.0127	0.00999	0.0190	0.0100
Zinc (Zn)-Total (mg/L)	0.0242	0.0361	0.0244	0.0516	0.0258
Dissolved Metals Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0100	0.530	0.0096	0.0249	0.0115
Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)-Dissolved (mg/L)	<0.00050	0.00070	<0.00050	0.00052	<0.00050
Barium (Ba)-Dissolved (mg/L)	0.058	0.059	0.062	0.079	0.060
Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2279150-6	L2279150-7			
	Description	Water	Water			
	Sampled Date	24-MAY-19	24-MAY-19			
	Sampled Time	12:25	13:03			
	Client ID	POUCE COUPE (POUCE)	PEACE AT MANY ISLANDS (PD5)			
Grouping	**Analyte**					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	0.000110	0.000217			
	Calcium (Ca)-Total (mg/L)	40.2	35.2			
	Chromium (Cr)-Total (mg/L)	0.0042	0.0042			
	Cobalt (Co)-Total (mg/L)	0.00230	0.00188			
	Copper (Cu)-Total (mg/L)	0.0081	0.0057			
	Iron (Fe)-Total (mg/L)	5.08	4.68			
	Lead (Pb)-Total (mg/L)	0.00306	0.00242			
	Lithium (Li)-Total (mg/L)	0.0084	0.0057			
	Magnesium (Mg)-Total (mg/L)	12.3	9.40			
	Manganese (Mn)-Total (mg/L)	0.0715	0.0757			
	Mercury (Hg)-Total (mg/L)	0.0000217	0.0000187			
	Mercury (Hg)-Total (ug/L)	0.0105	0.0128			
	Molybdenum (Mo)-Total (mg/L)	<0.0010	0.0011			
	Nickel (Ni)-Total (mg/L)	0.0098	0.0073			
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30			
	Potassium (K)-Total (mg/L)	3.9	<2.0			
	Selenium (Se)-Total (mg/L)	0.000406	0.000596			
	Silicon (Si)-Total (mg/L)	5.26	4.99			
	Silver (Ag)-Total (mg/L)	0.000040	0.000049			
	Sodium (Na)-Total (mg/L)	12.1	2.3			
	Strontium (Sr)-Total (mg/L)	0.186	0.118			
	Thallium (Tl)-Total (mg/L)	0.000058	0.000072			
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050			
	Titanium (Ti)-Total (mg/L)	0.018	0.019			
	Uranium (U)-Total (mg/L)	0.00083	0.00050			
	Vanadium (V)-Total (mg/L)	0.00920	0.00947			
	Zinc (Zn)-Total (mg/L)	0.0227	0.0243			
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD			
	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0174	0.129			
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050			
	Arsenic (As)-Dissolved (mg/L)	0.00078	<0.00050			
	Barium (Ba)-Dissolved (mg/L)	0.040	0.063			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010			
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2279150-1	L2279150-2	L2279150-3	L2279150-4	L2279150-5
Description	Water	Water	Water	Water	Water
Sampled Date	24-MAY-19	24-MAY-19	24-MAY-19	24-MAY-19	24-MAY-19
Sampled Time	08:05	08:30	09:26	09:53	10:55
Client ID	PEACE AT BEATTON (PD2)	BEATTON RIVER (BEA)	PEACE AT KISKATINAW (PD3)	KISKATINAW RIVER (KR)	PEACE AT POUCE COUPE (PD4)
Grouping **Analyte**					
WATER					
Dissolved Metals Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium (Cd)-Dissolved (mg/L)	0.0000128	0.0000637	0.0000126	0.0000104	0.0000135
Calcium (Ca)-Dissolved (mg/L)	33.3	15.5	32.7	41.7	32.4
Chromium (Cr)-Dissolved (mg/L)	<0.0010	0.0010	<0.0010	<0.0010	<0.0010
Cobalt (Co)-Dissolved (mg/L)	<0.00030	0.00056	<0.00030	<0.00030	<0.00030
Copper (Cu)-Dissolved (mg/L)	<0.0010	0.0046	<0.0010	0.0026	<0.0010
Iron (Fe)-Dissolved (mg/L)	<0.030	1.09	<0.030	0.033	<0.030
Lead (Pb)-Dissolved (mg/L)	<0.00050	0.00073	<0.00050	<0.00050	<0.00050
Lithium (Li)-Dissolved (mg/L)	0.0027	0.0041	0.0028	0.0023	0.0027
Magnesium (Mg)-Dissolved (mg/L)	7.82	4.78	7.97	10.9	8.22
Manganese (Mn)-Dissolved (mg/L)	0.00354	0.0186	0.00368	0.00489	0.00323
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	0.0000136	<0.0000050	<0.0000050	<0.0000050
Mercury (Hg)-Dissolved (ug/L)	0.00128	0.0114	0.00121	0.00198	0.00139
Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Nickel (Ni)-Dissolved (mg/L)	0.0011	0.0049	0.0011	0.0018	0.0012
Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Selenium (Se)-Dissolved (mg/L)	0.000462	0.000256	0.000495	0.000240	0.000434
Silicon (Si)-Dissolved (mg/L)	1.51	3.48	1.52	2.14	1.64
Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Sodium (Na)-Dissolved (mg/L)	<2.0	6.4	<2.0	5.2	<2.0
Strontium (Sr)-Dissolved (mg/L)	0.103	0.0608	0.108	0.163	0.111
Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Titanium (Ti)-Dissolved (mg/L)	<0.010	0.012	<0.010	<0.010	<0.010
Uranium (U)-Dissolved (mg/L)	0.00030	0.00032	0.00030	0.00040	0.00033
Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00187	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	<0.0050	0.0059	<0.0050	<0.0050	<0.0050
Speciated Metals Methylmercury (as MeHg)-Dissolved (ug/L)	0.000027	0.000180	0.000036	0.000041	0.000031
Methylmercury (as MeHg)-Total (ug/L)	0.000071	0.000222	0.000084	0.000137	0.000093

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2279150-6	L2279150-7			
	Description	Water	Water			
	Sampled Date	24-MAY-19	24-MAY-19			
	Sampled Time	12:25	13:03			
	Client ID	POUCE COUPE (POUCE)	PEACE AT MANY ISLANDS (PD5)			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Boron (B)-Dissolved (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Dissolved (mg/L)	0.0000102	0.0000327			
	Calcium (Ca)-Dissolved (mg/L)	40.0	33.0			
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030			
	Copper (Cu)-Dissolved (mg/L)	0.0029	0.0015			
	Iron (Fe)-Dissolved (mg/L)	0.139	0.204			
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050			
	Lithium (Li)-Dissolved (mg/L)	0.0052	0.0030			
	Magnesium (Mg)-Dissolved (mg/L)	11.6	7.94			
	Manganese (Mn)-Dissolved (mg/L)	0.00926	0.00912			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Mercury (Hg)-Dissolved (ug/L)	0.00262	0.00261			
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010			
	Nickel (Ni)-Dissolved (mg/L)	0.0038	0.0016			
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30			
	Potassium (K)-Dissolved (mg/L)	3.7	<2.0			
	Selenium (Se)-Dissolved (mg/L)	0.000298	0.000433			
	Silicon (Si)-Dissolved (mg/L)	1.19	1.87			
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020			
	Sodium (Na)-Dissolved (mg/L)	11.9	2.1			
	Strontium (Sr)-Dissolved (mg/L)	0.183	0.110			
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020			
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050			
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010			
	Uranium (U)-Dissolved (mg/L)	0.00061	0.00035			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00067			
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050			
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000206	0.000038			
	Methylmercury (as MeHg)-Total (ug/L)	0.000260	0.000087			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Selenium (Se)-Total	MB-LOR	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Total Organic Carbon	MS-B	L2279150-2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Manganese (Mn)-Total	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2279150-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Reference Information

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-D-U-CVAF-VA Water Diss. Mercury in Water by CVAFS (Ultra) APHA 3030 B / EPA 1631 REV. E

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MEHG-D-GCAF-VA Water Diss. Methylmercury in Water by GCAFS EPA 1630

This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MEHG-T-GCAF-VA Water Total Methylmercury in Water by GCAFS EPA 1630

This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. THe separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg".

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2279150-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked	
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Phone:	1 (604) 313-9067	Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)
		Email 2	Brent.Finnestad@tetratech.com

Rush Turnaround Time (TAT) is not available for all tests)

- R ☑ Regular (Standard TAT if received by 3 pm - business days)
- P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
- E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
- E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge

Specify Date Required for E2,E or P:

Invoice To		Invoice Distribution	
Same as Report To	☐ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Copy of Invoice with Report	☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	L2279150	ALS Contact: Brent Mack	Sampler: Elyse Hofs

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/Hg (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)			Number of Containers
	Peace at Beatton (PD2)	24 May 19	8:05	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Beatton River (BEA)	↓	8:30	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Peace at Kiskatinaw (PD3)	↓	9:26	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Kiskatinaw River (KR)	↓	9:53	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Peace at Pouce Coupe (PD4)	↓	10:55	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Pouce Coupe (POUCE)	↓	12:25	Water	R	R	R	R	R	R	R	R	R	R	R			11
	Peace at Many Islands (PD5)	↓	1:03	Water	R	R	R	R	R	R	R	R	R	R	R			11

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐			SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated ☒					

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
7 / 11	6°c

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Elyse Hofs	Date: 24May19	Time: 16:30	Received by: Geoff	Date: May 24/19	Time: 16:30	Received by: [signature]	Date: May 25	Time: 11:25am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

7/9

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 24-JUN-19
Report Date: 09-JUL-19 14:08 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2297595

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID	L2297595-1	L2297595-2	L2297595-3	L2297595-4	L2297595-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	24-JUN-19	24-JUN-19	24-JUN-19	24-JUN-19	24-JUN-19
		Sampled Time	09:30	10:00	13:20	11:50	13:20
		Client ID	WILLISTON SHALLOW (W1-SHALLOW)	WILLISTON DEEP (W1-DEEP)	DINOSAUR SHALLOW (D1-SHALLOW)	DINOSAUR DEEP (D1-DEEP)	DUPLICATE 2 (DUP 2)
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		1.12	1.18	1.41	2.06	1.36

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2297595-1 Water 24-JUN-19 09:30 WILLISTON SHALLOW (W1-SHALLOW)	L2297595-2 Water 24-JUN-19 10:00 WILLISTON DEEP (W1-DEEP)	L2297595-3 Water 24-JUN-19 13:20 DINOSAUR SHALLOW (D1-SHALLOW)	L2297595-4 Water 24-JUN-19 11:50 DINOSAUR DEEP (D1-DEEP)	L2297595-5 Water 24-JUN-19 13:20 DUPLICATE 2 (DUP 2)
WATER						
Physical Tests	Colour, True (CU)	6.3	6.2	5.3	6.8	5.1
	Conductivity (uS/cm)	193	193	195	197	186
	pH (pH)	8.26	8.28	8.28	8.29	8.15
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	106	117	117	117	119
	Turbidity (NTU)	1.06	1.03	0.55	0.52	0.61
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	84.7	84.9	85.0	84.3	85.7
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	84.7	84.9	85.0	84.3	85.7
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0115	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	0.81
	Fluoride (F) (mg/L)	0.040	0.040	0.043	0.043	0.048
	Nitrate and Nitrite (as N) (mg/L)	0.0562	0.0568	0.0442	0.0487	0.0631
	Nitrate (as N) (mg/L)	0.0562	0.0568	0.0442	0.0487	0.0631
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.141	0.141	0.162	0.105	0.120
	Total Nitrogen (mg/L)	0.218	0.168	0.215	0.198	0.207
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0090	0.0037	0.0099	0.0144	0.0039
	Silicate (as SiO2) (mg/L)	4.54	4.42	4.45	4.43	4.54
	Sulfate (SO4) (mg/L)	15.1	15.1	15.2	15.4	15.3
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.55	2.60	1.93	2.32	2.34
	Total Organic Carbon (mg/L)	2.97	2.49	2.97	2.66	2.50

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Nitrogen	MS-B	L2297595-1, -2, -3, -4, -5
Matrix Spike	Phosphorus (P)-Total	MS-B	L2297595-1, -2, -3, -4, -5
Matrix Spike	Sulfate (SO4)	MS-B	L2297595-5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2297595-COFC

COC Number: 14 -

Page 1 of 1

Report To		**Report Format / Distribution**	**Select Service Level Below** (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2 Brent.Finnestad@tetratech.com	

Invoice To	Same as Report To ☑ Yes ☐ No	**Invoice Distribution**	
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax ebaaccountspayable@tetratech.com	
Contact:		Email 2 Lucas.Hennecker@tetratech.com (see notes)	

Project Information		**Oil and Gas Required Fields (client use)**	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only) L2297595 **ALS Contact:** Brent Mack **Sampler:** Lucas Hennecker

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/f (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)	chlorophyll a (field filtered 250 mL) (F)	Number of Containers
	Williston Shallow (W1 - Shallow)	24 Jun-19	9:30	Water	R	R	R	R	R							R	4
	Williston Deep (W1 - Deep)		10:00	Water	R	R	R	R	R							R	4
	Dinosaur Shallow (D1 - Shallow)		13:20	Water	R	R	R	R	R							R	4
	Dinosaur Deep (D1 - Deep)		11:50	Water	R	R	R	R	R							R	4
	Duplicate 2 (DUP 2)		13:20	Water	R	R	R	R	R							R	4
	~~Peace Canyon (PC1)~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~								~~4~~

Drinking Water (DW) Samples[1] (client use)	**Special Instructions / Specify Criteria to add on report (client Use)**
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. Samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
2	11°C				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: June 24/19	Time: 15:40	Received by:	Date: June 24/19	Time: 3:40 Pm	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 25-JUN-19
Report Date: 12-JUL-19 17:24 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2298412

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03058-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2298412-6				
Description	Water				
Sampled Date	25-JUN-19				
Sampled Time	10:15				
Client ID	FIELD BLANK				
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	<0.010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2298412-1 Water 25-JUN-19 08:07 HALFWAY RIVER - DOWNSTREAM (HD)	L2298412-2 Water 25-JUN-19 08:40 MIDDLE SITE C RESERVOIR (PR2)	L2298412-3 Water 25-JUN-19 12:56 PEACE CANYON (PC1)	L2298412-4 Water 25-JUN-19 10:17 UPPER SITE C RESERVOIR (PR1)	L2298412-5 Water 25-JUN-19 08:40 DUPLICATE 1 (DUP 1)
WATER						
Physical Tests	Colour, True (CU)	8.0	6.1	7.8	5.7	10.7
	Conductivity (uS/cm)	376	205	249	196	205
	Hardness (as CaCO3) (mg/L)	221	109		104	109
	pH (pH)	8.46	8.27	8.32	8.26	8.26
	Total Suspended Solids (mg/L)	268	20.2	<3.0	<3.0	20.2
	Total Dissolved Solids (mg/L)			139		
	TDS (Calculated) (mg/L)	239	112		106	113
	Turbidity (NTU)	166	20.5	1.27	1.43	18.4
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	170	87.8	103	84.5	89.1
	Alkalinity, Carbonate (as CaCO3) (mg/L)	10.2	<1.0	4.8	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	180	87.8	108	84.5	89.1
	Ammonia, Total (as N) (mg/L)	0.0098	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	5.02	<0.50	<0.50
	Fluoride (F) (mg/L)	0.107	0.051	0.061	0.049	0.051
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0562	0.0595	0.0594	0.0569
	Nitrate (as N) (mg/L)	<0.0050	0.0562	0.0595	0.0594	0.0569
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.453 RRV	0.149	0.096	0.064	0.125
	Total Nitrogen (mg/L)	0.237 RRV	0.172	0.186	0.172	0.187
	Orthophosphate-Dissolved (as P) (mg/L)	0.0057	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0055	0.0047	<0.0020	<0.0020	0.0050
	Phosphorus (P)-Total (mg/L)	0.239	0.0291	0.0032	0.0034	0.0319
	Silicate (as SiO2) (mg/L)	3.47	4.35	4.73	4.30	4.46
	Sulfate (SO4) (mg/L)	45.1	17.2	17.3	15.6	17.2
	Anion Sum (meq/L)	4.55	2.12		2.02	2.14
	Cation Sum (meq/L)	4.52	2.20		2.07	2.20
	Cation - Anion Balance (%)	-0.3	1.8		1.2	1.2
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.08	2.90	4.65 RRV	2.40	2.52
	Total Organic Carbon (mg/L)	6.09	2.78	3.36 RRV	2.39	2.96
Bacteriological Tests	E. coli (MPN/100mL)	179	47		<1	45
	HPC (CFU/1mL)	380 PEHR	128 PEHR		18 PEHR	86 PEHR
	Coliform Bacteria - Total (MPN/100mL)	770	201		4	299
Total Metals	Aluminum (Al)-Total (mg/L)	3.76	0.619		0.0523	0.560
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050		<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2298412-6				
	Description	Water				
	Sampled Date	25-JUN-19				
	Sampled Time	10:15				
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0				
	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (mg/L)	<0.50				
	pH (pH)	5.65				
	Total Suspended Solids (mg/L)	<3.0				
	Total Dissolved Solids (mg/L)					
	TDS (Calculated) (mg/L)	<1.0				
	Turbidity (NTU)	0.12 RRV				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate and Nitrite (as N) (mg/L)	<0.0051				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	<0.050				
	Total Nitrogen (mg/L)	<0.030				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	<0.30				
	Anion Sum (meq/L)	<0.10				
	Cation Sum (meq/L)	<0.10				
	Cation - Anion Balance (%)	0.0				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50				
	Total Organic Carbon (mg/L)	<0.50				
Bacteriological Tests	E. coli (MPN/100mL)	1				
	HPC (CFU/1mL)	207 PEHR				
	Coliform Bacteria - Total (MPN/100mL)	5				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0199 RRV				
	Antimony (Sb)-Total (mg/L)	<0.00050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2298412-1	L2298412-2	L2298412-3	L2298412-4	L2298412-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-JUN-19	25-JUN-19	25-JUN-19	25-JUN-19	25-JUN-19
	Sampled Time	08:07	08:40	12:56	10:17	08:40
	Client ID	HALFWAY RIVER - DOWNSTREAM (HD)	MIDDLE SITE C RESERVOIR (PR2)	PEACE CANYON (PC1)	UPPER SITE C RESERVOIR (PR1)	DUPLICATE 1 (DUP 1)
Grouping	**Analyte**					
WATER						
Total Metals	Arsenic (As)-Total (mg/L)	0.00284	0.00052		<0.00050	0.00051
	Barium (Ba)-Total (mg/L)	0.215	0.051		0.037	0.051
	Beryllium (Be)-Total (mg/L)	0.00021	<0.00010		<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20		<0.20	<0.20
	Boron (B)-Total (mg/L)	<0.10	<0.10		<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.000316	0.0000794		0.0000143	0.0000775
	Calcium (Ca)-Total (mg/L)	58.1	29.9		28.0	30.4
	Chromium (Cr)-Total (mg/L)	0.0063	0.0012		<0.0010	0.0010
	Cobalt (Co)-Total (mg/L)	0.00269	0.00034		<0.00030	0.00033
	Copper (Cu)-Total (mg/L)	0.0081	0.0017		<0.0010	0.0016
	Iron (Fe)-Total (mg/L)	6.14	0.770		0.057	0.737
	Lead (Pb)-Total (mg/L)	0.00328	<0.00050		<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.0099	0.0021		0.0013	0.0021
	Magnesium (Mg)-Total (mg/L)	16.8	7.39		6.50	7.34
	Manganese (Mn)-Total (mg/L)	0.0851	0.0170		0.00286	0.0169
	Mercury (Hg)-Total (mg/L)	0.0000153	<0.0000050		<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.0034	<0.0010		<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	0.0103	0.0019		<0.0010	0.0017
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30		<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0		<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.00168	0.000333		0.000336	0.000346
	Silicon (Si)-Total (mg/L)	7.82	3.43		2.40	3.31
	Silver (Ag)-Total (mg/L)	0.000077	<0.000020		<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	2.7	<2.0		<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	0.272	0.113		0.107	0.113
	Thallium (Tl)-Total (mg/L)	0.000124	0.000018		<0.000010	0.000017
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050		<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	0.038	0.017		<0.010	0.015
	Uranium (U)-Total (mg/L)	0.00110	0.00058		0.00050	0.00059
	Vanadium (V)-Total (mg/L)	0.0158	0.00267		<0.00050	0.00254
	Zinc (Zn)-Total (mg/L)	0.0349	<0.0050		<0.0050	<0.0050
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD	FIELD		FIELD	FIELD
	Dissolved Mercury Filtration Location	FIELD	FIELD		FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD		FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0274	0.0842		<0.0050	0.0575
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050		<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050		<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2298412-6				
	Description	Water				
	Sampled Date	25-JUN-19				
	Sampled Time	10:15				
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Total Metals	Arsenic (As)-Total (mg/L)	<0.00050				
	Barium (Ba)-Total (mg/L)	<0.020				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.20				
	Boron (B)-Total (mg/L)	<0.10				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	0.29 RRV				
	Chromium (Cr)-Total (mg/L)	<0.0010				
	Cobalt (Co)-Total (mg/L)	<0.00030				
	Copper (Cu)-Total (mg/L)	<0.0010				
	Iron (Fe)-Total (mg/L)	<0.030				
	Lead (Pb)-Total (mg/L)	<0.00050				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	<0.10				
	Manganese (Mn)-Total (mg/L)	0.00107 RRV				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	<0.0010				
	Nickel (Ni)-Total (mg/L)	<0.0010				
	Phosphorus (P)-Total (mg/L)	<0.30				
	Potassium (K)-Total (mg/L)	<2.0				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	<0.10				
	Silver (Ag)-Total (mg/L)	<0.000020				
	Sodium (Na)-Total (mg/L)	<2.0				
	Strontium (Sr)-Total (mg/L)	<0.0050				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00050				
	Titanium (Ti)-Total (mg/L)	<0.010				
	Uranium (U)-Total (mg/L)	<0.00020				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0050				
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD				
	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	<0.0050				
	Antimony (Sb)-Dissolved (mg/L)	<0.00050				
	Arsenic (As)-Dissolved (mg/L)	<0.00050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2298412-1 Water 25-JUN-19 08:07 HALFWAY RIVER - DOWNSTREAM (HD)	L2298412-2 Water 25-JUN-19 08:40 MIDDLE SITE C RESERVOIR (PR2)	L2298412-3 Water 25-JUN-19 12:56 PEACE CANYON (PC1)	L2298412-4 Water 25-JUN-19 10:17 UPPER SITE C RESERVOIR (PR1)	L2298412-5 Water 25-JUN-19 08:40 DUPLICATE 1 (DUP 1)
WATER						
Dissolved Metals	Barium (Ba)-Dissolved (mg/L)	0.069	0.039		0.035	0.039
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010		<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20		<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10		<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.0000177	0.0000134		0.0000106	0.0000191
	Calcium (Ca)-Dissolved (mg/L)	60.3	31.1		29.9	30.9
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010		<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030		<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010		<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	0.058		<0.030	0.048
	Ferrous Iron, Dissolved (mg/L)	<0.020	<0.020		<0.020	<0.020
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050		<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0056	0.0016		0.0011	0.0016
	Magnesium (Mg)-Dissolved (mg/L)	17.0	7.72		7.01	7.87
	Manganese (Mn)-Dissolved (mg/L)	0.00728	0.00291		0.00044	0.00290
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050		<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.0033	<0.0010		<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	0.0018	<0.0010		<0.0010	<0.0010
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30		<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0		<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.00130	0.000307		0.000270	0.000269
	Silicon (Si)-Dissolved (mg/L)	1.62	2.23		2.09	2.18
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020		<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	2.6	<2.0		<2.0	<2.0
	Strontium (Sr)-Dissolved (mg/L)	0.286	0.123		0.120	0.121
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020		<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050		<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010		<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00078	0.00054		0.00048	0.00052
	Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00057		<0.00050	0.00051
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050		<0.0050	<0.0050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2298412-6				
	Description	Water				
	Sampled Date	25-JUN-19				
	Sampled Time	10:15				
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Barium (Ba)-Dissolved (mg/L)	<0.020				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.20				
	Boron (B)-Dissolved (mg/L)	<0.10				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	0.12 RRV				
	Chromium (Cr)-Dissolved (mg/L)	<0.0010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00030				
	Copper (Cu)-Dissolved (mg/L)	<0.0010				
	Iron (Fe)-Dissolved (mg/L)	<0.030				
	Ferrous Iron, Dissolved (mg/L)	<0.020				
	Lead (Pb)-Dissolved (mg/L)	<0.00050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	<0.10				
	Manganese (Mn)-Dissolved (mg/L)	0.00041 RRV				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010				
	Nickel (Ni)-Dissolved (mg/L)	<0.0010				
	Phosphorus (P)-Dissolved (mg/L)	<0.30				
	Potassium (K)-Dissolved (mg/L)	<2.0				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	<0.050				
	Silver (Ag)-Dissolved (mg/L)	<0.000020				
	Sodium (Na)-Dissolved (mg/L)	<2.0				
	Strontium (Sr)-Dissolved (mg/L)	<0.0050				
	Thallium (Tl)-Dissolved (mg/L)	<0.00020				
	Tin (Sn)-Dissolved (mg/L)	<0.00050				
	Titanium (Ti)-Dissolved (mg/L)	<0.010				
	Uranium (U)-Dissolved (mg/L)	<0.00020				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Total Kjeldahl Nitrogen	B	L2298412-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Boron (B)-Dissolved	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Calcium (Ca)-Total	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Sodium (Na)-Total	MS-B	L2298412-1, -2, -4, -5, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L2298412-1, -2, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223

Reference Information

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

FE2-D-COL-VA Water Diss. Ferrous Iron in Water by Colour APHA 3500-Fe B/James Ball et al (1999)

This analysis is carried out using procedures adapted from APHA 3500-Fe B and "A New Method for the Direct Determination of Dissolved Iron Concentration in Acid Mine Waters" published by James W. Ball et al (1999). The procedure involves preliminary sample filtration, and ferrous iron is determined using the "FerroZine" colourimetric method.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Reference Information

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA Water Total coliform by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2298412-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)		R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No		P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX		E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:		**Oil and Gas Required Fields (client use)**	

Project Information			
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03058-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2298412 **ALS Contact:** Brent Mack **Sampler:** Lucas Hennecker

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3	DOC	Total Metals (CCME+ICP+Hardness) & Hg	Dissolved Metals (CCME+ICP+Hardness)/H	Total Hg ~~(ultra low detection limit)~~	Dissolved Hg (ultra low detection limit)	Total MeHg (ultra low detection limit)	chlorophyll a (field filtered 250 mL)	Total Coliform, E. coli, HPC	Dissolved Ferrous Iron	Number of Containers
						P	F/P	P		F	P	F	P		F	P	F/P	
	Halfway River - Downstream (HD)	25-June-19	8:07	Water	R	R	R	R	R	R	R					R	R	9
	Middle Site C Reservoir (PR2)		8:40	Water	R	R	R	R	R	R	R					R	R	9
	Peace Canyon (PC1)		12:56	Water	R	R	R	R	R									3
	Upper Site C Reservoir (PR1)		10:17	Water	R	R	R	R	R	R	R					R	R	9
	Duplicate 1 (DUP 1)		8:40	Water	R	R	R	R	R	R	R					R	R	9
	Field Blank		10:45	Water	R	R	R	R	R	R	R				R	R	R	10
	~~Trip Blank~~		—	~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~-~~	~~X~~	~~R~~					~~R~~		~~1~~

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from surface water. Please add nich.burnett@bchydro.com and bryan.koehler@bchydro.com to distribution list for results.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐			SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐		Custody seal intact	Yes ☐	No ☐	
Cooling Initiated	☐						

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C		
3	11.2°C					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: June.25/19	Time: 19:40	Received by: Shylin	Date: June 25/19	Time: 2:40	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM 0326e v09 front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 25-JUN-19
Report Date: 10-JUL-19 13:18 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2298411

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03058-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2298411-1				
	Description	Water				
	Sampled Date	25-JUN-19				
	Sampled Time					
	Client ID	TRIP BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0				
	Conductivity (uS/cm)	<2.0				
	pH (pH)	5.25				
	Total Suspended Solids (mg/L)	<3.0				
	Total Dissolved Solids (mg/L)	<10				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate and Nitrite (as N) (mg/L)	<0.0051				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	<0.050				
	Total Nitrogen (mg/L)	<0.030				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	<0.30				
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	<0.50				
Bacteriological Tests	E. coli (MPN/100mL)	<1				
	HPC (CFU/1mL)	<1 PEHR				
	Coliform Bacteria - Total (MPN/100mL)	<1				
Total Metals	Mercury (Hg)-Total (mg/L)	<0.0000050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2298411-1
Matrix Spike	Total Nitrogen	MS-B	L2298411-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA	Water	HPC by pour plate	APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

Reference Information

al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA	Water	Total coliform by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2298411-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked	
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Phone:	1 (604) 313-9067	Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)
		Email 2	Brent.Finnestad@tetratech.com

Invoice To		Invoice Distribution	
Same as Report To	☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Copy of Invoice with Report	☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03058-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	L2298411	ALS Contact: Brent Mack	Sampler: Lucas Hennecker

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

- R ☑ Regular (Standard TAT if received by 3 pm - business days)
- P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
- E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
- E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge

Specify Date Required for E2,E or P:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	~~DOC~~ (F/P)	~~Total Metals (CCME, ICP, Hardness) & Hg~~ (P)	~~Dissolved Metals (CCME ICP+ICP Hardness) & Hg~~ (F/P)	Total Hg (P)	Total Coliform, E. coli, HPC (P)					Number of Containers
	TRIP BLANK	25-Jun-19	—	Water	R	R	R	R	~~R~~	~~R~~	~~R~~	R	R					4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☒ No

Are samples for human drinking water use? ☐ Yes ☒ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from pre-treatment water sources. Please add bryan.koehler@bchydro.com to distribution list for results.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐ No ☐
Ice packs	Yes ☐ No ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated ☐			
INITIAL COOLER TEMPERATURES °C	16°C	FINAL COOLER TEMPERATURES °C	5°C (hug ate)

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: June 25/19	Time: 14:40	Received by: Sh[illegible]	Date: June 25/19	Time: 2040	Received by: ZZ	Date: June 26/2019	Time: 11:45am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 23-JUN-19
Report Date: 10-JUL-19 13:03 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2297001

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03058-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2297001-1 Water 23-JUN-19 07:56 MOBERLY RIVER - DOWNSTREAM (MD)	L2297001-2 Water 23-JUN-19 07:20 LOWER SITE C RESERVOIR (PR3)	L2297001-3 Water 23-JUN-19 08:35 PEACE AT PINE (PD1)	L2297001-4 Water 23-JUN-19 09:03 PINE RIVER (PINE)	
WATER						
Physical Tests	Colour, True (CU)	26.2	6.7	7.7	7.3	
	Conductivity (uS/cm)	198	233	234	234	
	Hardness (as CaCO3) (mg/L)	110	127	130	132	
	pH (pH)	8.25	8.30	8.30	8.32	
	Total Suspended Solids (mg/L)	37.3	12.3	14.9	25.9	
	TDS (Calculated) (mg/L)	119	136	138	137	
	Turbidity (NTU)	24.9	4.53	6.44	15.2	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	106	109	111	115	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	2.4	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	106	109	111	117	
	Ammonia, Total (as N) (mg/L)	0.0082	<0.0050	<0.0050	0.0131	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.58	
	Fluoride (F) (mg/L)	0.079	0.058	0.060	0.066	
	Nitrate and Nitrite (as N) (mg/L)	0.0262	0.0304	0.0283	0.0257	
	Nitrate (as N) (mg/L)	0.0252	0.0304	0.0283	0.0257	
	Nitrite (as N) (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.235	0.089	0.154	0.156	
	Total Nitrogen (mg/L)	0.361	0.145	0.199	0.133	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	0.0012	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0053	<0.0020	<0.0020	0.0022	
	Phosphorus (P)-Total (mg/L)	0.0465	0.0147	0.0151	0.0250	
	Silicate (as SiO2) (mg/L)	3.14	4.07	3.90	2.65	
	Sulfate (SO4) (mg/L)	8.80	22.1	21.5	14.2	
	Anion Sum (meq/L)	2.31	2.64	2.66	2.66	
	Cation Sum (meq/L)	2.20	2.54	2.61	2.73	
	Cation - Anion Balance (%)	-2.5	-1.9	-1.0	1.4	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.68	2.44	2.79	2.23	
	Total Organic Carbon (mg/L)	7.60	2.66	2.93	2.72	
Bacteriological Tests	E. coli (MPN/100mL)	66	2	9	4	
	HPC (CFU/1mL)	230 PEHR	34 PEHR	30 PEHR	45 PEHR	
	Coliform Bacteria - Total (MPN/100mL)	613	84	112	46	
Total Metals	Aluminum (Al)-Total (mg/L)	0.663	0.230	0.239	0.589	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	0.00066	<0.00050	<0.00050	<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2297001-1	L2297001-2	L2297001-3	L2297001-4	
	Description	Water	Water	Water	Water	
	Sampled Date	23-JUN-19	23-JUN-19	23-JUN-19	23-JUN-19	
	Sampled Time	07:56	07:20	08:35	09:03	
	Client ID	MOBERLY RIVER - DOWNSTREAM (MD)	LOWER SITE C RESERVOIR (PR3)	PEACE AT PINE (PD1)	PINE RIVER (PINE)	
Grouping	**Analyte**					
WATER						
Total Metals	Barium (Ba)-Total (mg/L)	0.172	0.059	0.066	0.103	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.0000556	0.0000409	0.0000324	0.0000520	
	Calcium (Ca)-Total (mg/L)	30.5	35.8	35.7	37.6	
	Chromium (Cr)-Total (mg/L)	0.0013	<0.0010	<0.0010	0.0010	
	Cobalt (Co)-Total (mg/L)	0.00051	<0.00030	<0.00030	0.00035	
	Copper (Cu)-Total (mg/L)	0.0024	<0.0010	0.0010	0.0012	
	Iron (Fe)-Total (mg/L)	1.25	0.266	0.312	0.853	
	Lead (Pb)-Total (mg/L)	0.00063	<0.00050	<0.00050	<0.00050	
	Lithium (Li)-Total (mg/L)	0.0040	0.0027	0.0027	0.0050	
	Magnesium (Mg)-Total (mg/L)	8.45	9.17	8.91	9.25	
	Manganese (Mn)-Total (mg/L)	0.0275	0.00788	0.00913	0.0182	
	Mercury (Hg)-Total (mg/L)	0.0000063	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	<0.0010	0.0015	0.0014	<0.0010	
	Nickel (Ni)-Total (mg/L)	0.0034	0.0014	0.0015	0.0018	
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Total (mg/L)	0.000189	0.000541	0.000484	0.000468	
	Silicon (Si)-Total (mg/L)	2.46	2.43	2.45	2.31	
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	2.2	
	Strontium (Sr)-Total (mg/L)	0.0808	0.156	0.149	0.124	
	Thallium (Tl)-Total (mg/L)	0.000020	<0.000010	0.000011	0.000017	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Total (mg/L)	0.00025	0.00063	0.00056	0.00032	
	Vanadium (V)-Total (mg/L)	0.00299	0.00140	0.00144	0.00243	
	Zinc (Zn)-Total (mg/L)	0.0061	<0.0050	<0.0050	<0.0050	
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0282	0.0139	0.0195	0.0699	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	0.129	0.045	0.053	0.083	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2297001-1 Water 23-JUN-19 07:56 MOBERLY RIVER - DOWNSTREAM (MD)	L2297001-2 Water 23-JUN-19 07:20 LOWER SITE C RESERVOIR (PR3)	L2297001-3 Water 23-JUN-19 08:35 PEACE AT PINE (PD1)	L2297001-4 Water 23-JUN-19 09:03 PINE RIVER (PINE)	
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Dissolved (mg/L)	0.0000095	0.0000107	0.0000154	0.0000152	
	Calcium (Ca)-Dissolved (mg/L)	31.7	37.7	38.4	38.7	
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Copper (Cu)-Dissolved (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	
	Iron (Fe)-Dissolved (mg/L)	0.057	<0.030	<0.030	0.093	
	Ferrous Iron, Dissolved (mg/L)	0.045	<0.020	<0.020	0.044	
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Lithium (Li)-Dissolved (mg/L)	0.0034	0.0025	0.0026	0.0047	
	Magnesium (Mg)-Dissolved (mg/L)	7.44	8.06	8.37	8.47	
	Manganese (Mn)-Dissolved (mg/L)	0.00533	0.00156	0.00222	0.00572	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	0.0014	0.0015	<0.0010	
	Nickel (Ni)-Dissolved (mg/L)	0.0014	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Dissolved (mg/L)	0.000166	0.000493	0.000499	0.000462	
	Silicon (Si)-Dissolved (mg/L)	1.45	1.88	1.86	1.38	
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	2.0	
	Strontium (Sr)-Dissolved (mg/L)	0.0732	0.146	0.152	0.117	
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Dissolved (mg/L)	<0.00020	0.00056	0.00054	0.00029	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Total Nitrogen	B	L2297001-1, -2, -3, -4
Laboratory Control Sample	Silicon (Si)-Total	MES	L2297001-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2297001-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2297001-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2297001-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2297001-1, -2, -3, -4
Matrix Spike	Aluminum (Al)-Total	MS-B	L2297001-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L2297001-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2297001-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2297001-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2297001-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the

Reference Information

positive responses to a probability table.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

FE2-D-COL-VA Water Diss. Ferrous Iron in Water by Colour APHA 3500-Fe B/James Ball et al (1999)

This analysis is carried out using procedures adapted from APHA 3500-Fe B and "A New Method for the Direct Determination of Dissolved Iron Concentration in Acid Mine Waters" published by James W. Ball et al (1999). The procedure involves preliminary sample filtration, and ferrous iron is determined using the "FerroZine" colourimetric method.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Reference Information

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA Water Total coliform by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2297001-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Dis...	...ush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	1 (604) 313-9067	Email 1 or Fax Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2 Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax ebaaccountspayable@tetratech.com	
Company:		Email 2 Lucas.Hennecker@tetratech.com (see notes)	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03058-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2297001 **ALS Contact:** Brent Mack **Sampler:** Lucas Hennecker

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/Hg (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)	Total Coliform, E. coli, HPC (P)	Dissolved Ferrous Iron (F/P)	Number of Containers
	Moberly River - Downstream (MD)	23-Jun-19	7:56	Water	R	R	R	R	R	R	R					R	R	
	Lower Site C Reservoir (PR3)		7:20	Water	R	R	R	R	R	R	R					R	R	
	Peace at Pine (PD1)		8:35	Water	R	R	R	R	R	R	R					R	R	
	Pine River (Pine)		9:03	Water	R	R	R	R	R	R	R					R	R	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from surface water. Please and nich.burnett@bchydro.com and bryan.koehler@bchydro.com to distribution list for results.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☒				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
10			4°		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: June 23/19	Time: 15:00	Received by: Geoff	Date: June 23/19	Time: 15:00	Received by:	Date: June 24	Time: 10:57am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA FM 03269 v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 23-JUN-19
Report Date: 10-JUL-19 13:07 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2297002

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2297002-1 Water 22-JUN-19 08:05 PEACE AT BEATTON (PD2)	L2297002-2 Water 22-JUN-19 08:34 BEATTON RIVER (BEA)	L2297002-3 Water 22-JUN-19 09:09 PEACE AT KISKATINAW (PD3)	L2297002-4 Water 22-JUN-19 09:35 KISKATINAW RIVER (KR)	L2297002-5 Water 22-JUN-19 10:20 PEACE AT POUCE COUPE (PD4)
WATER						
Physical Tests	Colour, True (CU)	6.6	81.9	6.5	31.6	9.6
	Conductivity (uS/cm)	239	248	239	353	242
	pH (pH)	8.38	8.21	8.39	8.56	8.40
	Total Suspended Solids (mg/L)	27.9	41.5	25.1	92.7	27.7
	Total Dissolved Solids (mg/L)	143	195	141	241	137
	Turbidity (NTU)	11.4	39.5	12.7	118	16.4
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	107	80.9	106	180	108
	Alkalinity, Carbonate (as CaCO3) (mg/L)	5.8	<1.0	6.2	14.8	6.4
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	112	80.9	112	195	114
	Ammonia, Total (as N) (mg/L)	0.0051	0.0108	<0.0050	0.0203	0.0052
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	0.99	<0.50	0.58	<0.50
	Fluoride (F) (mg/L)	0.061	0.108	0.062	0.086	0.062
	Nitrate and Nitrite (as N) (mg/L)	0.0278	<0.0051	0.0275	0.0349	0.0270
	Nitrate (as N) (mg/L)	0.0278	<0.0050	0.0275	0.0312	0.0270
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0037	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.133	0.683	0.129	0.578	0.170
	Total Nitrogen (mg/L)	0.219	0.709	0.214	0.609	0.230
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	0.0015	<0.0010	0.0029	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0029	0.0164	0.0021	0.0083	0.0022
	Phosphorus (P)-Total (mg/L)	0.0251	0.0668	0.0220	0.122	0.0281
	Silicate (as SiO2) (mg/L)	3.33	4.57	3.45	4.91	3.50
	Sulfate (SO4) (mg/L)	17.6	41.1	18.6	11.7	18.3
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.61	18.3	2.89	11.3	3.07
	Total Organic Carbon (mg/L)	2.81	19.4	2.98	13.3	3.36

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2297002-6	L2297002-7			
	Description	Water	Water			
	Sampled Date	22-JUN-19	22-JUN-19			
	Sampled Time	13:46	11:48			
	Client ID	POUCE COUPE (POUCE)	PEACE AT MANY ISLANDS (PD5)			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	50.3	10.1			
	Conductivity (uS/cm)	497	240			
	pH (pH)	8.46	8.39			
	Total Suspended Solids (mg/L)	20.1	19.7			
	Total Dissolved Solids (mg/L)	326	144			
	Turbidity (NTU)	25.8	14.7			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	152	106			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	9.4	5.8			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	162	112			
	Ammonia, Total (as N) (mg/L)	0.0240	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	5.80	<0.50			
	Fluoride (F) (mg/L)	0.146	0.059			
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0241			
	Nitrate (as N) (mg/L)	<0.0050	0.0241			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.936	0.143			
	Total Nitrogen (mg/L)	0.921	0.139			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0124	<0.0020			
	Phosphorus (P)-Total (mg/L)	0.0469	0.0205			
	Silicate (as SiO2) (mg/L)	1.11	3.49			
	Sulfate (SO4) (mg/L)	96.0	19.0			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	19.4	3.01			
	Total Organic Carbon (mg/L)	20.8	3.50			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Total Nitrogen	B	L2297002-1, -2, -3, -4, -5
Matrix Spike	Dissolved Organic Carbon	MS-B	L2297002-6, -7
Matrix Spike	Total Organic Carbon	MS-B	L2297002-6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2297002-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Dis.		Turnaround Time (TAT) (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2297002 **ALS Contact:** Brent Mack **Sampler:** Lucas Hennecker

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/H (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)			Number of Containers
	Peace at Beatton (PD2)	22-Jun-19	8:05	Water	R	R	R	R	R									3
	Beatton River (BEA)		8:34	Water	R	R	R	R	R									3
	Peace at Kiskatinaw (PD3)		9:09	Water	R	R	R	R	R									3
	Kiskatinaw River (KR)		9:35	Water	R	R	R	R	R									3
	Peace at Pouce Coupe (PD4)		10:20	Water	R	R	R	R	R									3
	Pouce Coupe (POUCE)		13:46	Water	R	R	R	R	R									3
	Peace at Many Islands (PD5)		11:48	Water	R	R	R	R	R									3

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. Samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results .
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☑	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☑				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
8					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Lucas Hennecker	June. 23/19	15:00	Geoff	June 23/19	15:00			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 25-JUL-19
Report Date: 06-AUG-19 13:47 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2318093

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2318093-1	L2318093-2	L2318093-3	L2318093-4	L2318093-5
Description	Water	Water	Water	Water	Water
Sampled Date	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
Sampled Time	09:30	10:00	13:15	12:45	13:15
Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 2 (DUP 2)
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	1.26	1.06	0.814	0.714	0.790

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318093-1	L2318093-2	L2318093-3	L2318093-4	L2318093-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19	25-JUL-19
	Sampled Time	09:30	10:00	13:15	12:45	13:15
	Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 2 (DUP 2)
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	6.7	<5.0	7.3	6.6	6.6
	Conductivity (uS/cm)	185	183	186	186	186
	pH (pH)	8.21	8.21	8.22	8.20	8.22
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	114	114	115	118	114
	Turbidity (NTU)	0.76	0.97	0.77	1.02	0.77
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	81.8	80.8	83.1	82.8	84.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	81.8	80.8	83.1	82.8	84.0
	Ammonia, Total (as N) (mg/L)	0.0052	0.0087	0.0072	0.0064	0.0456
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.039	0.038	0.046	0.041	0.045
	Nitrate and Nitrite (as N) (mg/L)	0.0441	0.0450	0.0272	0.0545	0.0272
	Nitrate (as N) (mg/L)	0.0441	0.0450	0.0272	0.0545	0.0272
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.105	0.154	0.127	0.091	0.159
	Total Nitrogen (mg/L)	0.164	0.152	0.150	0.232	0.195
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0031	0.0031	0.0036	0.0026
	Silicate (as SiO2) (mg/L)	3.89	3.76	3.92	3.99	3.95
	Sulfate (SO4) (mg/L)	14.1	13.5	14.5	14.1	14.4
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.32	2.35	2.76	2.44	2.90
	Total Organic Carbon (mg/L)	2.48	2.41	2.84	2.62	2.97

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318093-6				
	Description	Water				
	Sampled Date	25-JUL-19				
	Sampled Time	15:15				
	Client ID	PEACE CANYON (PC1)				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	5.6				
	Conductivity (uS/cm)	187				
	pH (pH)	8.20				
	Total Suspended Solids (mg/L)	<3.0				
	Total Dissolved Solids (mg/L)	116				
	Turbidity (NTU)	0.66				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	83.2				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	83.2				
	Ammonia, Total (as N) (mg/L)	0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	0.041				
	Nitrate and Nitrite (as N) (mg/L)	0.0607				
	Nitrate (as N) (mg/L)	0.0607				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.077				
	Total Nitrogen (mg/L)	0.157				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	0.0029				
	Silicate (as SiO2) (mg/L)	4.19				
	Sulfate (SO4) (mg/L)	14.3				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.23				
	Total Organic Carbon (mg/L)	2.39				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Reference Information

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2318093-COFC

COC Number: 14 -

Page 1 of 1

Report To	
Company:	Tetra Tech Canada Inc.
Contact:	Lucas Hennecker
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5
Phone:	1 (604) 313-9067

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ Yes ☐ No
☑ Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)
Email 2	Brent.Finnestad@tetratech.com

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

- R ☑ Regular (Standard TAT if received by 3 pm - business days)
- P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
- E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
- E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge

Specify Date Required for E2,E or P:

Invoice To	
Same as Report To	☑ Yes ☐ No
Copy of Invoice with Report	☑ Yes ☐ No
Company:	
Contact:	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ebaaccountspayable@tetratech.com
Email 2	Lucas.Hennecker@tetratech.com (see notes)

Project Information	
ALS Quote #:	Q53931
Job #:	VENW03060-03.002
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
Approver ID:	Cost Center:
GL Account:	Routing Code:
Activity Code:	
Location:	

ALS Lab Work Order # (lab use only): L2318093.

ALS Contact: Brent Mack

Sampler: Lucas Hennecker

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-Species Anions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/-Hg (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)	chlorophyll a (field filtered 250 mL) (F)		Number of Containers
	Williston Shallow (W1 - Shallow)	25-Jul-19	9:30	Water	R	R	R	R	R							R		4
	Williston Deep (W1 - Deep)	↓	10:00	Water	R	R	R	R	R							R		4
	Dinosaur Shallow (D1 - Shallow)	↓	13:15	Water	R	R	R	R	R							R		4
	Dinosaur Deep (D1 - Deep)	↓	12:45	Water	R	R	R	R	R							R		4
	Duplicate 2 (DUP 2)	↓	13:15	Water	R	R	R	R	R							R		4
	Peace Canyon (PC1)	↓	15:15	Water	R	R	R	R	R									3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. Samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐ No ☐
Ice packs	Yes ☒ No ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated ☒			

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
9	5? (at at 2)

SHIPMENT RELEASE (client use)	INITIAL SHIPMENT RECEPTION (lab use only)	FINAL SHIPMENT RECEPTION (lab use only)
Released by: Lucas Hennecker Date: July 25/19 Time: 17:00	Received by: Geoff Date: July 25/19 Time: 17:00	Received by: [signature] Date: July 27 Time: 11:00am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326 v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 26-JUL-19
Report Date: 06-AUG-19 13:53 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2318094

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2318094-5				
Description	Water				
Sampled Date	26-JUL-19				
Sampled Time	11:25				
Client ID	FIELD BLANK				
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	<0.010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318094-1	L2318094-2	L2318094-3	L2318094-4	L2318094-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-JUL-19	26-JUL-19	26-JUL-19	26-JUL-19	26-JUL-19
	Sampled Time	10:17	10:41	08:50	08:50	11:25
	Client ID	HALFWAY RIVER - DOWNSTREAM (HD)	MIDDLE SITE C RESERVOIR (PR2)	UPPER SITE C RESERVOIR (PR1)	DUPLICATE 1 (DUP 1)	FIELD BLANK
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	56.9	5.7	5.7	5.0	<5.0
	Conductivity (uS/cm)	307	190	188	188	<2.0
	pH (pH)	8.27	8.23	8.21	8.22	5.52
	Total Suspended Solids (mg/L)	530	3.2	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	276	121	119	114	<10
	Turbidity (NTU)	416	1.90	0.79	0.74	0.25
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	134	85.8	85.1	84.7	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	134	85.8	85.1	84.7	<1.0
	Ammonia, Total (as N) (mg/L)	0.0402	0.0072	0.0059	0.0051	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.115	0.041	0.040	0.040	<0.020
	Nitrate and Nitrite (as N) (mg/L)	0.0095	0.0552	0.0589	0.0588	<0.0051
	Nitrate (as N) (mg/L)	0.0095	0.0552	0.0589	0.0588	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	1.12 RRV	0.138	0.128	0.138	<0.050
	Total Nitrogen (mg/L)	0.646 RRV	0.161	0.188	0.174	<0.030
	Orthophosphate-Dissolved (as P) (mg/L)	0.0058	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.246	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.530	0.0068	0.0039	0.0034	<0.0020
	Silicate (as SiO2) (mg/L)	4.18	3.96	4.16	3.0	<0.50
	Sulfate (SO4) (mg/L)	38.1	14.6	14.4	14.4	<0.30
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	12.3	2.42	2.22	2.46	<0.50
	Total Organic Carbon (mg/L)	18.1	2.67	2.46	2.54	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2318094-6				
	Description	Water				
	Sampled Date					
	Sampled Time					
	Client ID	TRIP BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0				
	Conductivity (uS/cm)	<2.0				
	pH (pH)	5.41				
	Total Suspended Solids (mg/L)	<3.0				
	Total Dissolved Solids (mg/L)	<10				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate and Nitrite (as N) (mg/L)	<0.0051				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	<0.050				
	Total Nitrogen (mg/L)	<0.030				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	<0.30				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)	<0.50				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2318094-6
Matrix Spike	Total Organic Carbon	MS-B	L2318094-6
Matrix Spike	Total Nitrogen	MS-B	L2318094-1
Matrix Spike	Phosphorus (P)-Total	MS-B	L2318094-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental — Canada Toll Free: 1 800 668 9878
www.alsglobal.com

L2318094-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2318094. **ALS Contact:** Brent Mack **Sampler:** Lucas Hennecke

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/Hg (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	chlorophyll a (field filtered 250 mL) (F)	Total Coliform, E. coli, HPC (P)	Dissolved Ferrous Iron (F/P)	Number of Containers
	Halfway River - Downstream (HD)	26-July-19	10:17	Water	R	R	R	R	R									3
	Middle Site C Reservoir (PR2)		10:41	Water	R	R	R	R	R									3
	~~Peace Canyon (PC1)~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~									~~3~~
	Upper Site C Reservoir (PR1)		8:50	Water	R	R	R	R	R									3
	Duplicate 1 (DUP 1)		8:50	Water	R	R	R	R	R									3
	Field Blank		11:25	Water	R	R	R	R	R						R			4
	Trip Blank	/	/	Water	R	R	R	R										2

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from surface water. Please add nich.burnett@bchydro.com and bryan.koehler@bchydro.com to distribution list for results.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐		SIF Observations	Yes ☐	No ☒
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☒				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
12°C				5° (on ice)	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Lucas Hennecker	July 26/19	13:45		July 26/19	1-45		July 27	11:00am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326a v03 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 23-JUL-19
Report Date: 30-JUL-19 16:05 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2315473

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2315473-1 Water 23-JUL-19 13:14 MOBERLY RIVER - DOWNSTREAM (MD)	L2315473-2 Water 23-JUL-19 12:20 LOWER SITE C RESERVOIR (PR3)	L2315473-3 Water 23-JUL-19 13:48 PEACE AT PINE (PD1)	L2315473-4 Water 23-JUL-19 14:18 PINE RIVER (PINE)	
WATER						
Physical Tests	Colour, True (CU)	18.5	10.2	11.5	8.3	
	Conductivity (uS/cm)	206	213	216	245	
	pH (pH)	8.27	8.22	8.25	8.36	
	Total Suspended Solids (mg/L)	12.7	51.5	47.1	18.1	
	Total Dissolved Solids (mg/L)	159	157	155	158	
	Turbidity (NTU)	9.28	22.1	26.5	9.95	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	113	104	102	120	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	2.4	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	113	104	102	123	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0066	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.56	
	Fluoride (F) (mg/L)	0.076	0.050	0.052	0.060	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0438	0.0379	0.0091	
	Nitrate (as N) (mg/L)	<0.0050	0.0438	0.0379	0.0091	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.188	0.134	0.156	0.131	
	Total Nitrogen (mg/L)	0.224	0.197	0.235	0.131	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0029	0.0020	0.0100	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0182	0.0454	0.0509	0.0196	
	Silicate (as SiO2) (mg/L)	2.49	3.97	3.80	2.27	
	Sulfate (SO4) (mg/L)	9.17	19.7	20.1	14.8	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.21	3.64	3.78	2.78	
	Total Organic Carbon (mg/L)	6.20	3.71	4.11	3.01	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Phosphorus (P)-Total Dissolved	MS-B	L2315473-1, -2, -3, -4
Matrix Spike	Silicate (as SiO2)	MS-B	L2315473-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Reference Information

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com
Canada Toll Free: 1 800 668 9878

L2315473-COFC

COC Number: 14 -
Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution		
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax	ebaaccountspayable@tetratech.com	
Contact:		Email 2	Lucas.Hennecker@tetratech.com (see notes)	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2315473.
ALS Contact: Brent Mack
Sampler: Lucas Hennecker

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	P TOC, TN, TP, TDP, TKN, NH3	F/P DOC	P Total Metals (CCME+ICP+Hardness) & Hg	F/P Dissolved Metals (CCME+ICP+Hardness)/Hg	F Total Hg (ultra low detection limit)	P Dissolved Hg (ultra low detection limit)	F/P Total MeHg (ultra low detection limit)	P Dissolved MeHg (ultra low detection limit)	F/P Total Coliform, E. coli, HPC	P Dissolved Ferrous Iron	Number of Containers
	Moberly River - Downstream (MD)	23-July-19	13:14	Water	R	R	R	R	R									3
	Lower Site C Reservoir (PR3)	↓	12:20	Water	R	R	R	R	R									3
	Peace at Pine (PD1)	↓	13:48	Water	R	R	R	R	R									3
	Pine River (Pine)	↓	14:18	Water	R	R	R	R	R									3

Drinking Water (DW) Samples[1] (client use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No
Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)
Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from surface water. Please and nich.burnett@bchydro.com and bryan.koehler@bchydro.com to distribution list for results.

SAMPLE CONDITION AS RECEIVED (lab use only)
Frozen ☐ SIF Observations Yes ☐ No ☑
Ice packs Yes ☑ No ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☑

INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C		
12	15°C			5

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: July 23/19	Time: 15:45	Received by:	Date: July 23/19	Time: 3:45	Received by:	Date: 7/24	Time: 12:10pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION
WHITE - LABORATORY COPY YELLOW - CLIENT COPY
NA-FM-0326e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 24-JUL-19
Report Date: 02-AUG-19 16:44 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2317044

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2317044-1 Water 24-JUL-19 08:31 PEACE AT BEATTON (PD2)	L2317044-2 Water 24-JUL-19 08:55 BEATTON RIVER (BEA)	L2317044-3 Water 24-JUL-19 09:33 PEACE AT KISKATINAW (PD3)	L2317044-4 Water 24-JUL-19 09:59 KISKATINAW RIVER (KR)	L2317044-5 Water 24-JUL-19 10:42 PEACE AT POUCE COUPE (PD4)
WATER						
Physical Tests	Colour, True (CU)	12.4	163	18.8	28.6	20.3
	Conductivity (uS/cm)	243	154	234	345	232
	pH (pH)	8.33	7.83	8.32	8.56	8.25
	Total Suspended Solids (mg/L)	86.2	552	82.0	169	72.6
	Total Dissolved Solids (mg/L)	176	276	185	288	186
	Turbidity (NTU)	27.4	247	47.3	158	64.1
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	111	49.8	107	184	112
	Alkalinity, Carbonate (as CaCO3) (mg/L)	2.0	<1.0	1.8	10.6	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	113	49.8	109	194	112
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0241	0.0163	0.0141	0.0116
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.64	<0.50
	Fluoride (F) (mg/L)	0.062	0.102	0.064	0.091	0.064
	Nitrate and Nitrite (as N) (mg/L)	0.0317	<0.0051	0.0355	0.0188	0.0345
	Nitrate (as N) (mg/L)	0.0302	<0.0050	0.0355	0.0175	0.0345
	Nitrite (as N) (mg/L)	0.0015	<0.0010	<0.0010	0.0013	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.201	1.32	0.299	0.437	0.260
	Total Nitrogen (mg/L)	0.221	1.16	0.264	0.456	0.278
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	0.0045	0.0018	0.0017	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0047	0.0161	0.0037	0.0457	0.0031
	Phosphorus (P)-Total (mg/L)	0.0637	0.526	0.0754	0.132	0.0842
	Silicate (as SiO2) (mg/L)	3.41	5.22	3.56	4.48	3.41
	Sulfate (SO4) (mg/L)	21.0	26.8	21.2	9.57	19.9
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.63	27.1	4.95	11.5	5.27
	Total Organic Carbon (mg/L)	4.54	42.1	6.14	12.3	6.81

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2317044-6	L2317044-7			
	Description	Water	Water			
	Sampled Date	24-JUL-19	24-JUL-19			
	Sampled Time	14:21	12:09			
	Client ID	POUCE COUPE (POUCE)	PEACE AT MANY ISLANDS (PD5)			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	46.0	23.9			
	Conductivity (uS/cm)	522	227			
	pH (pH)	8.43	8.25			
	Total Suspended Solids (mg/L)	20.0	93.4			
	Total Dissolved Solids (mg/L)	408	185			
	Turbidity (NTU)	28.9	68.2			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	157	108			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	4.6	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	162	108			
	Ammonia, Total (as N) (mg/L)	0.0158	0.0113			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	7.21	0.51			
	Fluoride (F) (mg/L)	0.167	0.066			
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0330			
	Nitrate (as N) (mg/L)	<0.0050	0.0330			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.778	0.283			
	Total Nitrogen (mg/L)	0.814	0.282			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0103	0.0153			
	Phosphorus (P)-Total (mg/L)	0.0402	0.098			
	Silicate (as SiO2) (mg/L)	0.65	3.45			
	Sulfate (SO4) (mg/L)	120	21.7			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	18.9	5.92			
	Total Organic Carbon (mg/L)	19.3	7.73			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2317044-1, -2, -3, -4, -6, -7
Matrix Spike	Total Nitrogen	MS-B	L2317044-2
Matrix Spike	Silicate (as SiO2)	MS-B	L2317044-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Total Kjeldahl Nitrogen	MS-B	L2317044-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.			
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2317044-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2317044

ALS Contact: Brent Mack **Sampler:** Lucas Hennecker

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/Hg (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)			Number of Containers
	Peace at Beatton (PD2)	24-Jul-19	8:31	Water	R	R	R	R	R									3
	Beatton River (BEA)		8:55	Water	R	R	R	R	R									3
	Peace at Kiskatinaw (PD3)		9:33	Water	R	R	R	R	R									3
	Kiskatinaw River (KR)		9:59	Water	R	R	R	R	R									3
	Peace at Pouce Coupe (PD4)		10:42	Water	R	R	R	R	R									3
	Pouce Coupe (POUCE)		14:21	Water	R	R	R	R	R									3
	Peace at Many Islands (PD5)		12:09	Water	R	R	R	R	R									3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. Samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☒

Ice packs Yes ☒ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☒

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
10			13.3	1	0.7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: July 24/19	Time: 17:50	Received by: Geoff	Date: July 24/19	Time: 17:50	Received by: SR	Date: 7/26/19	Time: 11:40AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326a v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 22-AUG-19
Report Date: 06-SEP-19 16:23 (MT)
Version: FINAL REV. 2

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2334419

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Comments:

6-SEP-2019 This report replaces the previous version and contains updated detection limits for TSS for certain samples.

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2334419-1	L2334419-2	L2334419-3	L2334419-4	L2334419-5
Description	Water	Water	Water	Water	Water
Sampled Date	22-AUG-19	22-AUG-19	22-AUG-19	22-AUG-19	22-AUG-19
Sampled Time	09:00	09:30	12:30	12:00	12:30
Client ID	WILLISTON SHALLOW	WILLISTON DEEP	DINOSAUR SHALLOW	DINOSAUR DEEP	DUPLICATE 2
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	1.17	1.22	0.821	1.15	1.20

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2334419-1	L2334419-2	L2334419-3	L2334419-4	L2334419-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	22-AUG-19	22-AUG-19	22-AUG-19	22-AUG-19	22-AUG-19
	Sampled Time	09:00	09:30	12:30	12:00	12:30
	Client ID	WILLISTON SHALLOW	WILLISTON DEEP	DINOSAUR SHALLOW	DINOSAUR DEEP	DUPLICATE 2
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0	5.2	9.1	9.3	9.9
	Conductivity (uS/cm)	185	185	191	190	190
	pH (pH)	8.19	8.18	8.17	8.17	8.17
	Total Suspended Solids (mg/L)	<3.0	<3.0	4.4	<3.0	5.4
	Total Dissolved Solids (mg/L)	119	118	123	122	124
	Turbidity (NTU)	0.83	0.86	6.98	7.25	7.37
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	83.7	82.5	86.9	85.6	85.9
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	83.7	82.5	86.9	85.6	85.9
	Ammonia, Total (as N) (mg/L)	0.0056	<0.0050	0.0157	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.038	0.041	0.039	0.046	0.045
	Nitrate and Nitrite (as N) (mg/L)	0.0432	0.0420	0.0584	0.0580	0.0552
	Nitrate (as N) (mg/L)	0.0421	0.0420	0.0584	0.0580	0.0552
	Nitrite (as N) (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.084	0.117	0.095	0.083	0.073
	Total Nitrogen (mg/L)	0.138	0.148	0.183	0.171	0.166
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0024	0.0032	0.0080	0.0076	0.0070
	Silicate (as SiO2) (mg/L)	3.99	4.00	4.29	4.50	4.25
	Sulfate (SO4) (mg/L)	13.1	13.1	13.9	14.0	13.8
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.45	2.51	3.00	2.80	2.93
	Total Organic Carbon (mg/L)	2.45	2.30	3.11	2.99	2.99

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2334419-6				
	Description	Water				
	Sampled Date	22-AUG-19				
	Sampled Time	15:30				
	Client ID	PEACE CANYON				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	12.6				
	Conductivity (uS/cm)	256				
	pH (pH)	8.25				
	Total Suspended Solids (mg/L)	3.4				
	Total Dissolved Solids (mg/L)	161				
	Turbidity (NTU)	5.25				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	122				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	122				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	3.63				
	Fluoride (F) (mg/L)	0.068				
	Nitrate and Nitrite (as N) (mg/L)	0.0454				
	Nitrate (as N) (mg/L)	0.0454				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.089				
	Total Nitrogen (mg/L)	0.212				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	0.0073				
	Silicate (as SiO2) (mg/L)	5.41				
	Sulfate (SO4) (mg/L)	15.0				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.59				
	Total Organic Carbon (mg/L)	4.15				

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

Reference Information

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2334419-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	1 (604) 313-9067	Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2334419.

ALS Contact: Brent Mack **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/Hg (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)	chlorophyll a (field filtered 250 mL) (F)		Number of Containers
	Williston Shallow (W1 - Shallow)	22-08-19	9:00	Water	R	R	R	R	R							R		4
	Williston Deep (W1 - Deep)		9:30	Water	R	R	R	R	R							R		4
	Dinosaur Shallow (D1 - Shallow)		12:30	Water	R	R	R	R	R							R		4
	Dinosaur Deep (D1 - Deep)		12:00	Water	R	R	R	R	R							R		4
	Duplicate 2 (DUP 2)		12:30	Water	R	R	R	R	R							R		4
	Peace Canyon (PC1)		15:30	Water	R	R	R	R	R									3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. Samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☑ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
6°C					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Elyse Hofs	Date: 22 Aug 19	Time: 16:52	Received by: SHm	Date: Aug 22/19	Time: 16:52	Received by: IAP	Date: 8/23	Time: 12 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326e v09 Front/on January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 23-AUG-19
Report Date: 04-SEP-19 16:37 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2334987

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2334987-5				
Description	Water				
Sampled Date	23-AUG-19				
Sampled Time	10:58				
Client ID	FIELD BLANK				
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	<0.010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2334987-1	L2334987-2	L2334987-3	L2334987-4	L2334987-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-AUG-19	23-AUG-19	23-AUG-19	23-AUG-19	23-AUG-19
	Sampled Time	10:10	10:42	08:55	08:55	10:58
	Client ID	HALFWAY RIVER - DOWNSTREAM (HD)	MIDDLE SITE C RESERVOIR (PR2)	UPPER SITE C RESERVOIR (PR1)	DUPLICATE 1 (DUP1)	FIELD BLANK
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	77.0	15.8	8.6	8.8	<5.0
	Conductivity (uS/cm)	297	196	190	190	<2.0
	pH (pH)	8.27	8.20	8.21	8.20	5.92
	Total Suspended Solids (mg/L)	614	59.8	6.4	4.8	<3.0
	Total Dissolved Solids (mg/L)	298	125	120	121	<10
	Turbidity (NTU)	419	34.5	5.15	5.62	0.50 RRV
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	132	91.9	87.7	91.3	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	132	91.9	87.7	91.3	<1.0
	Ammonia, Total (as N) (mg/L)	0.0164	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.096	0.045	0.039	0.040	<0.020
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0569	0.0620	0.0622	<0.0051
	Nitrate (as N) (mg/L)	<0.0050	0.0569	0.0620	0.0622	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.350	0.174	0.120	0.101	<0.050
	Total Nitrogen (mg/L)	0.409	0.239	0.178	0.171	<0.030
	Orthophosphate-Dissolved (as P) (mg/L)	0.0045	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0100	0.0023	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.600	0.0586	0.0088	0.0083	<0.0020
	Silicate (as SiO2) (mg/L)	4.30	4.53	4.34	4.45	<0.50
	Sulfate (SO4) (mg/L)	31.8	14.0	13.1	13.5	<0.30
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	13.7	4.07	3.13	3.35	<0.50
	Total Organic Carbon (mg/L)	14.6	5.04	3.03	3.05	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2334987-6				
	Description	Water				
	Sampled Date	23-AUG-19				
	Sampled Time	10:58				
	Client ID	TRIP BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0				
	Conductivity (uS/cm)	<2.0				
	pH (pH)	5.57				
	Total Suspended Solids (mg/L)	<3.0				
	Total Dissolved Solids (mg/L)	<10				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate and Nitrite (as N) (mg/L)	<0.0051				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	<0.050				
	Total Nitrogen (mg/L)	<0.030				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)					
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	<0.30				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)	<0.50				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2334987-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2334987-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2334987

ALS Contact: Brent Mack **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3	DOC	Total Metals (CCME+ICP+Hardness) & Hg	Dissolved Metals (CCME+ICP+Hardness)/Hg	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit)	Total MeHg (ultra low detection limit)	chlorophyll a (field filtered 250 mL)	Total Coliform, E. coli, HPC	Dissolved Ferrous Iron	Number of Containers
					P			P	F/P	P	F/P		F	P	F	P	F/P	
	Halfway River - Downstream (HD)	23-08-19	10:10	Water	R	R	R	R	R									3
	Middle Site C Reservoir (PR2)		10:42	Water	R	R	R	R	R									3
	~~Peace Canyon (PC1)~~			Water	R	R	R	R	R									3
	Upper Site C Reservoir (PR1)		8:55	Water	R	R	R	R	R									3
	Duplicate 1 (DUP 1)		8:55	Water	R	R	R	R	R									3
	Field Blank		10:58	Water	R	R	R	R	R						R			4
	Trip Blank		10:58	Water	R	R	R	R										2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from surface water. Please add nich.burnett@bchydro.com and bryan.koehler@bchydro.com to distribution list for results.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐		SIF Observations	Yes ☐	No ☒
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
8°C					3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Elyse Hofs	23Aug19	13:10		Aug 23/19	1:10		8/24	12:40 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326a v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 20-AUG-19
Report Date: 03-SEP-19 11:21 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2332416

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2332416-1	L2332416-2	L2332416-3	L2332416-4	
	Description	Water	Water	Water	Water	
	Sampled Date	20-AUG-19	20-AUG-19	20-AUG-19	20-AUG-19	
	Sampled Time	13:30	12:55	14:18	14:50	
	Client ID	MOBERLY RIVER - DOWNSTREAM (MD)	LOWER SITE C RESERVOIR (PR3)	PEACE AT PINE (PD1)	PINE RIVER (PINE)	
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	75.1	63.3	58.2	40.1	
	Conductivity (uS/cm)	219	226	222	220	
	pH (pH)	8.18	8.04	8.06	8.18	
	Total Suspended Solids (mg/L)	180	1150	1180	498	
	Total Dissolved Solids (mg/L)	210	283	285	209	
	Turbidity (NTU)	184	1080	1030	327	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	116	107	92.1	112	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	116	107	92.1	112	
	Ammonia, Total (as N) (mg/L)		0.0377	0.0406	0.0123	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	0.92	0.53	0.64	0.62	
	Fluoride (F) (mg/L)	0.082	0.098	0.094	0.068	
	Nitrate and Nitrite (as N) (mg/L)	0.0634	0.0443	0.0465	0.0708	
	Nitrate (as N) (mg/L)	0.0634	0.0432	0.0449	0.0708	
	Nitrite (as N) (mg/L)	<0.0010	0.0011	0.0016	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	1.65 RRV	0.412	0.353	0.277	
	Total Nitrogen (mg/L)	1.24	0.412	0.401	0.303	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0014	0.0057	0.0039	0.0016	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0156	0.282	0.0123	0.0045	
	Phosphorus (P)-Total (mg/L)	0.159	0.906	0.890	0.410	
	Silicate (as SiO2) (mg/L)	3.94	4.57	4.63	3.34	
	Sulfate (SO4) (mg/L)	7.40	24.9	24.0	12.6	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	14.4	13.0	11.9	8.11	
	Total Organic Carbon (mg/L)	14.4	13.6	12.9	8.26	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2332416-1, -2, -3, -4
Matrix Spike	Total Organic Carbon	MS-B	L2332416-1, -2, -3, -4
Matrix Spike	Total Nitrogen	MS-B	L2332416-1
Matrix Spike	Phosphorus (P)-Total	MS-B	L2332416-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2332416-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2332416 **ALS Contact:** Brent Mack **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3	DOC	Total Metals (CCME+ICP+Hardness) & Hg	Dissolved Metals (CCME+ICP+Hardness)/Hg	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit)	Total MeHg (ultra low detection limit)	Dissolved MeHg (ultra low detection limit)	Total Coliform, E. coli, HPC	Dissolved Ferrous Iron	Number of Containers
								P	F/P	P	F/P		F	P	F/P	P	F/P	
	Moberly River - Downstream (MD)	20-08-19	13:30	Water	R	R	R	R	R									3
	Lower Site C Reservoir (PR3)	↓	12:55	Water	R	R	R	R	R									3
	Peace at Pine (PD1)		14:18	Water	R	R	R	R	R									3
	Pine River (Pine)	↓	14:50	Water	R	R	R	R	R									3

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from surface water. Please and nich.burnett@bchydro.com and bryan.koehler@bchydro.com to distribution list for results.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐			SIF Observations	Yes ☐	No	☒
Ice packs	Yes ☒	No ☐		Custody seal intact	Yes ☐	No	☐
Cooling Initiated	☐						

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
10°C					3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Elyse Hofs	Aug. 20/19	15:40		Aug 21/19	3:40	H A	8/21	12:35pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 21-AUG-19
Report Date: 05-SEP-19 12:38 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2333813

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333813-1	L2333813-2	L2333813-3	L2333813-4	L2333813-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	21-AUG-19	21-AUG-19	21-AUG-19	21-AUG-19	21-AUG-19
	Sampled Time	08:30	08:55	09:35	10:05	10:53
	Client ID	PEACE AT BEATTON (PD2)	BEATTON RIVER (BEA)	PEACE AT KISKATINAW (PD3)	KISKATINAW RIVER (KR)	PEACE AT POUCE COUPE (PD4)
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	44.9	211	60.7	70.2	60.5
	Conductivity (uS/cm)	223	165	221	304	234
	pH (pH)	8.14	7.68	8.07	8.26	8.06
	Total Suspended Solids (mg/L)	670	1980	956	2020	1020
	Total Dissolved Solids (mg/L)	235	271	253	385	300
	Turbidity (NTU)	374	2790	703	3170	808
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	107	48.4	104	177	110
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	107	48.4	104	177	110
	Ammonia, Total (as N) (mg/L)	0.0234	0.0769	0.0353	0.0969	0.0380
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.55	1.17	0.52	1.09	0.62
	Fluoride (F) (mg/L)	0.079	0.107	0.084	0.101	0.089
	Nitrate and Nitrite (as N) (mg/L)	0.0580	0.0180	0.0533	0.0526	0.0544
	Nitrate (as N) (mg/L)	0.0580	0.0180	0.0533	0.0515	0.0544
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0011	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.374	1.09	0.507	0.699	0.412
	Total Nitrogen (mg/L)	0.357	0.827	0.428	0.709	0.421
	Orthophosphate-Dissolved (as P) (mg/L)	0.0029	0.0043	0.0035	0.0037	0.0033
	Phosphorus (P)-Total Dissolved (mg/L)	0.0051	0.195	0.0081	0.0103	0.0089
	Phosphorus (P)-Total (mg/L)	0.869	1.48	0.817	1.70	0.839
	Silicate (as SiO2) (mg/L)	3.91	6.07	4.23	4.91	4.18
	Sulfate (SO4) (mg/L)	17.1	27.4	20.0	8.12	18.9
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	9.06	35.1 HTP	11.7	17.8	12.3
	Total Organic Carbon (mg/L)	10.6	84.1	14.2	20.8	13.8

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2333813-6	L2333813-7			
	Description	Water	Water			
	Sampled Date	21-AUG-19	21-AUG-19			
	Sampled Time	11:18	12:40			
	Client ID	POUCE COUPE (POUCE)	PEACE AT MANY ISLANDS (PD5)			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	76.3	68.0			
	Conductivity (uS/cm)	336	231			
	pH (pH)	8.03	8.05			
	Total Suspended Solids (mg/L)	1080	869			
	Total Dissolved Solids (mg/L)	353	258			
	Turbidity (NTU)	1870	751			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	119	106			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	119	106			
	Ammonia, Total (as N) (mg/L)	0.0903	0.0332			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	6.49	0.65			
	Fluoride (F) (mg/L)	0.142	0.091			
	Nitrate and Nitrite (as N) (mg/L)	0.0890	0.0522			
	Nitrate (as N) (mg/L)	0.0835	0.0522			
	Nitrite (as N) (mg/L)	0.0055	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.949	0.615			
	Total Nitrogen (mg/L)	0.926	0.492			
	Orthophosphate-Dissolved (as P) (mg/L)	0.0071	0.0039			
	Phosphorus (P)-Total Dissolved (mg/L)	0.401	0.0096			
	Phosphorus (P)-Total (mg/L)	12.8	0.700			
	Silicate (as SiO2) (mg/L)	4.24	4.18			
	Sulfate (SO4) (mg/L)	46.9	21.0			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	22.5 HTP	12.9			
	Total Organic Carbon (mg/L)	24.9	16.0			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2333813-2
Matrix Spike	Phosphorus (P)-Total	MS-B	L2333813-1, -2, -3, -4
Matrix Spike	Phosphorus (P)-Total Dissolved	MS-B	L2333813-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTP	Sample preparation or preservation hold time was exceeded.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2333813-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	1 (604) 313-9067	Email 1 or Fax Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2 Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	Analysis Request
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax ebaaccountspayable@tetratech.com	
Company:		Email 2 Lucas.Hennecker@tetratech.com (see notes)	
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2333813.

ALS Contact: Brent Mack **Sampler:**

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 P	DOC F/P	Total Metals (CCME+ICP+Hardness) & Hg P	Dissolved Metals (CCME+ICP+Hardness)/H F/P	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) F	Total MeHg (ultra low detection limit) P	Dissolved MeHg (ultra low detection limit) F/P			Number of Containers
	Peace at Beatton (PD2)	21-08-19	8:30	Water	R	R	R	R	R									3
	Beatton River (BEA)		8:55	Water	R	R	R	R	R									3
	Peace at Kiskatinaw (PD3)		9:35	Water	R	R	R	R	R									3
	Kiskatinaw River (KR)		10:05	Water	R	R	R	R	R									3
	Peace at Pouce Coupe (PD4)		10:53	Water	R	R	R	R	R									3
	Pouce Coupe (POUCE)		11:18	Water	R	R	R	R	R									3
	Peace at Many Islands (PD5)		12:40	Water	R	R	R	R	R									3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. Samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☒ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C		
7	10°C			5

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Elyse Hofs	21-08-19	17:14		Aug 21/19	5:15	MA	8/23	8:7 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 24-SEP-19
Report Date: 04-OCT-19 10:40 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2353324

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2353324-1 Water 24-SEP-19 10:00 WILLISTON SHALLOW (W1 - SHALLOW)	L2353324-2 Water 24-SEP-19 10:30 WILLISTON DEEP (W1 - DEEP)	L2353324-3 Water 24-SEP-19 13:00 DINOSAUR SHALLOW (S1 - SHALLOW)	L2353324-4 Water 24-SEP-19 12:15 DINOSAUR DEEP (D1 - DEEP)	L2353324-5 Water 24-SEP-19 13:00 DUPLICATE 2 (DUP 2)
Sample ID		L2353324-1	L2353324-2	L2353324-3	L2353324-4	L2353324-5
Description		Water	Water	Water	Water	Water
Sampled Date		24-SEP-19	24-SEP-19	24-SEP-19	24-SEP-19	24-SEP-19
Sampled Time		10:00	10:30	13:00	12:15	13:00
Client ID		WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (S1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 2 (DUP 2)
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.37	1.41	1.01	0.911	0.825

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2353324-1	L2353324-2	L2353324-3	L2353324-4	L2353324-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	24-SEP-19	24-SEP-19	24-SEP-19	24-SEP-19	24-SEP-19
	Sampled Time	10:00	10:30	13:00	12:15	13:00
	Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (S1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 2 (DUP 2)
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	5.8	5.3	6.0	7.8	7.1
	Conductivity (uS/cm)	179	179	189	186	187
	pH (pH)	8.14	8.16	8.21	8.12	8.15
	Total Suspended Solids (mg/L)	4.6	3.2	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	107	104	115	110	110
	Turbidity (NTU)	2.65	1.78	1.02	1.28	1.01
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	82.1	82.3	84.1	86.1	85.6
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	82.1	82.3	84.1	86.1	85.6
	Ammonia, Total (as N) (mg/L)	0.0055	0.0054	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.036	0.036	0.037	0.037	0.037
	Nitrate and Nitrite (as N) (mg/L)	0.0468	0.0468	0.0611	0.0610	0.0611
	Nitrate (as N) (mg/L)	0.0442	0.0444	0.0600	0.0600	0.0600
	Nitrite (as N) (mg/L)	0.0026	0.0024	0.0011	0.0010	0.0011
	Total Kjeldahl Nitrogen (mg/L)	0.083	0.100	0.088	0.081	0.088
	Total Nitrogen (mg/L)	0.139	0.128	0.144	0.153	0.151
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0072	0.0050	0.0039	0.0035	0.0035
	Silicate (as SiO2) (mg/L)	3.96	4.01	4.49	4.37	4.57
	Sulfate (SO4) (mg/L)	13.7	13.7	14.4	14.4	14.4
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.87	2.84	2.75	2.81	2.63
	Total Organic Carbon (mg/L)	2.91	2.74	3.30	3.11	2.77

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2353324-6				
	Description	Water				
	Sampled Date	24-SEP-19				
	Sampled Time	14:00				
	Client ID	PEACE CANYON (PC1)				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	7.2				
	Conductivity (uS/cm)	193				
	pH (pH)	8.16				
	Total Suspended Solids (mg/L)	<3.0				
	Total Dissolved Solids (mg/L)	113				
	Turbidity (NTU)	1.01				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	88.7				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	88.7				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	0.59				
	Fluoride (F) (mg/L)	0.039				
	Nitrate and Nitrite (as N) (mg/L)	0.0572				
	Nitrate (as N) (mg/L)	0.0572				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.104				
	Total Nitrogen (mg/L)	0.173				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	0.0040				
	Silicate (as SiO2) (mg/L)	4.44				
	Sulfate (SO4) (mg/L)	14.4				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.68				
	Total Organic Carbon (mg/L)	3.22				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2353324-1, -2, -3, -4, -5, -6
Matrix Spike	Total Nitrogen	MS-B	L2353324-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2353324-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	1 (604) 313-9067	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2	Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	Lucas.Hennecker@tetratech.com (see notes)
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2353324.

ALS Contact: Brent Mack **Sampler:** Lucas Hennecker

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	P TOC, TN, TP, TDP, TKN, NH3	F/P DOC	P Total Metals (CCME+ICP+Hardness) & Hg	F/P Dissolved Metals (CCME+ICP+Hardness)/Hg	F Total Hg (ultra low detection limit)	P Dissolved Hg (ultra low detection limit)	F/P Total MeHg (ultra low detection limit)	F Dissolved MeHg (ultra low detection limit)	chlorophyll a (field filtered 250 mL)		Number of Containers
1	Williston Shallow (W1 - Shallow)	24-Sept-19	10:00	Water	R	R	R	R	R							R		4
2	Williston Deep (W1 - Deep)		10:30	Water	R	R	R	R	R							R		4
3	Dinosaur Shallow (D1 - Shallow)		13:00	Water	R	R	R	R	R							R		4
4	Dinosaur Deep (D1 - Deep)		12:15	Water	R	R	R	R	R							R		4
5	Duplicate 2 (DUP 2)		13:00	Water	R	R	R	R	R							R		4
6	Peace Canyon (PC1)		14:00	Water	R	R	R	R	R									3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. Samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☒

Ice packs Yes ☒ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
3 | 8°C	5°

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: Sept. 24/19	Time: 15:50	Received by: Shyla	Date: Sep 24/19	Time: 3:51	Received by: RD	Date: SEP 25,19	Time: ~~11:00~~ 11:35

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 25-SEP-19
Report Date: 04-OCT-19 10:42 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2354314

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03058-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2354314-1 Water 25-SEP-19 11:45 HALFWAY RIVER - DOWNSTREAM (HD)	L2354314-2 Water 25-SEP-19 11:15 MIDDLE SITE C RESERVOIR (PR2)	L2354314-3 Water 25-SEP-19 09:30 UPPER SITE C RESERVOIR (PR1)	L2354314-4 Water 25-SEP-19 09:30 DUPLICATE 1 (DUP 1)	
WATER						
Physical Tests	Colour, True (CU)	23.9	6.8	6.3	6.4	
	Conductivity (uS/cm)	399	194	189	189	
	Hardness (as CaCO3) (mg/L)	214	100	97.1	97.9	
	pH (pH)	8.48	8.26	8.25	8.25	
	Total Suspended Solids (mg/L)	33.2	6.2	<3.0	<3.0	
	TDS (Calculated) (mg/L)	249	112	108	109	
	Turbidity (NTU)	26.7	3.46	1.11	1.12	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	180	97.5	94.4	94.3	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	13.6	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	194	97.5	94.4	94.3	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.100	0.043	0.038	0.040	
	Nitrate and Nitrite (as N) (mg/L)	0.0104	0.0560	0.0571	0.0586	
	Nitrate (as N) (mg/L)	0.0104	0.0560	0.0571	0.0586	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.174	0.069	0.077	0.067	
	Total Nitrogen (mg/L)	0.133	0.114	0.106	0.123	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0035	<0.0020	<0.0020	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0368	0.0072	0.0040	0.0038	
	Silicate (as SiO2) (mg/L)	4.43	4.30	4.45	4.97	
	Sulfate (SO4) (mg/L)	50.1	15.1	14.4	14.5	
	Anion Sum (meq/L)	4.92	2.27	2.19	2.19	
	Cation Sum (meq/L)	4.41	2.00	1.94	1.96	
	Cation - Anion Balance (%)	-5.5	-6.3	-6.1	-5.7	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.59	2.70	2.49	2.48	
	Total Organic Carbon (mg/L)	5.40	2.63	2.38	2.37	
Bacteriological Tests	E. coli (MPN/100mL)	7	1	<1	<1	
	HPC (CFU/1mL)	69	38	29	31	
	Coliform Bacteria - Total (MPN/100mL)	205	91	65	43	
Total Metals	Aluminum (Al)-Total (mg/L)	0.618	0.130	0.0475	0.0521	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	0.00058	<0.00050	<0.00050	<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2354314-1	L2354314-2	L2354314-3	L2354314-4	
	Description	Water	Water	Water	Water	
	Sampled Date	25-SEP-19	25-SEP-19	25-SEP-19	25-SEP-19	
	Sampled Time	11:45	11:15	09:30	09:30	
	Client ID	HALFWAY RIVER - DOWNSTREAM (HD)	MIDDLE SITE C RESERVOIR (PR2)	UPPER SITE C RESERVOIR (PR1)	DUPLICATE 1 (DUP 1)	
Grouping	**Analyte**					
WATER						
Total Metals	Barium (Ba)-Total (mg/L)	0.110	0.038	0.035	0.035	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.0000827	0.0000283	0.0000165	0.0000191	
	Calcium (Ca)-Total (mg/L)	59.7	28.7	27.0	28.4	
	Chromium (Cr)-Total (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	
	Cobalt (Co)-Total (mg/L)	0.00045	<0.00030	<0.00030	<0.00030	
	Copper (Cu)-Total (mg/L)	0.0019	0.0010	<0.0010	<0.0010	
	Iron (Fe)-Total (mg/L)	1.03	0.136	0.050	0.057	
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Lithium (Li)-Total (mg/L)	0.0068	0.0015	0.0012	0.0013	
	Magnesium (Mg)-Total (mg/L)	16.9	6.82	6.20	6.21	
	Manganese (Mn)-Total (mg/L)	0.0203	0.00391	0.00199	0.00191	
	Mercury (Hg)-Total (mg/L)	0.0000220	0.0000111	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.0035	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Total (mg/L)	0.0034	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Total (mg/L)	0.00136	0.000244	0.000229	0.000283	
	Silicon (Si)-Total (mg/L)	2.73	2.25	2.05	2.05	
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Total (mg/L)	2.8	<2.0	<2.0	<2.0	
	Strontium (Sr)-Total (mg/L)	0.284	0.106	0.104	0.108	
	Thallium (Tl)-Total (mg/L)	0.000027	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Total (mg/L)	0.00079	0.00050	0.00048	0.00047	
	Vanadium (V)-Total (mg/L)	0.00301	0.00082	<0.00050	0.00050	
	Zinc (Zn)-Total (mg/L)	0.0061	<0.0050	<0.0050	<0.0050	
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0170	0.0056	0.0072	0.0071	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	0.101	0.038	0.035	0.037	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2354314-1	L2354314-2	L2354314-3	L2354314-4	
Description	Water	Water	Water	Water	
Sampled Date	25-SEP-19	25-SEP-19	25-SEP-19	25-SEP-19	
Sampled Time	11:45	11:15	09:30	09:30	
Client ID	HALFWAY RIVER - DOWNSTREAM (HD)	MIDDLE SITE C RESERVOIR (PR2)	UPPER SITE C RESERVOIR (PR1)	DUPLICATE 1 (DUP 1)	
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	
Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	
Cadmium (Cd)-Dissolved (mg/L)	0.0000220	0.0000081	0.0000085	0.0000114	
Calcium (Ca)-Dissolved (mg/L)	57.5	28.7	27.9	28.4	
Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Iron (Fe)-Dissolved (mg/L)	0.061	<0.030	<0.030	<0.030	
Ferrous Iron, Dissolved (mg/L)	0.061	<0.020	<0.020	<0.020	
Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
Lithium (Li)-Dissolved (mg/L)	0.0059	0.0014	0.0012	0.0012	
Magnesium (Mg)-Dissolved (mg/L)	17.2	6.90	6.65	6.55	
Manganese (Mn)-Dissolved (mg/L)	0.00779	0.00071	0.00071	0.00070	
Mercury (Hg)-Dissolved (mg/L)	0.0000144	0.0000062	<0.0000050	<0.0000050	
Molybdenum (Mo)-Dissolved (mg/L)	0.0032	<0.0010	<0.0010	<0.0010	
Nickel (Ni)-Dissolved (mg/L)	0.0020	<0.0010	<0.0010	<0.0010	
Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	
Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	
Selenium (Se)-Dissolved (mg/L)	0.00135	0.000241	0.000261	0.000333	
Silicon (Si)-Dissolved (mg/L)	1.82	1.94	1.86	1.99	
Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
Sodium (Na)-Dissolved (mg/L)	2.8	<2.0	<2.0	<2.0	
Strontium (Sr)-Dissolved (mg/L)	0.273	0.105	0.105	0.105	
Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
Uranium (U)-Dissolved (mg/L)	0.00067	0.00045	0.00043	0.00045	
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Coliform Bacteria - Total	DUPM	L2354314-1, -2, -3, -4
Matrix Spike	Ferrous Iron, Dissolved	MS-B	L2354314-1, -2, -3, -4
Matrix Spike	Aluminum (Al)-Total	MS-B	L2354314-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L2354314-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2354314-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2354314-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Total	MS-B	L2354314-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L2354314-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2354314-1, -2, -3, -4
Matrix Spike	Phosphorus (P)-Total Dissolved	MS-B	L2354314-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUPM	MPN duplicate results were outside default ALS Data Quality Objective, but within 95% confidence interval for MPN reference method. Sample results are reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

FE2-D-COL-VA Water Diss. Ferrous Iron in Water by Colour APHA 3500-Fe B/James Ball et al (1999)

This analysis is carried out using procedures adapted from APHA 3500-Fe B and "A New Method for the Direct Determination of Dissolved Iron Concentration in Acid Mine Waters" published by James W. Ball et al (1999). The procedure involves preliminary sample filtration, and ferrous iron is determined using the "FerroZine" colourimetric method.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-HLTH-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Reference Information

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA Water Total coliform by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2354314-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		(Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)		R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No		P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX		E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	1 (604) 313-9067	Email 1 or Fax Lucas.Hennecker@tetratech.com (see notes)		Specify Date Required for E2,E or P:
		Email 2 Brent.Finnestad@tetratech.com		

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax ebaaccountspayable@tetratech.com	
Contact:		Email 2 Lucas.Hennecker@tetratech.com (see notes)	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03058-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2354314 | **ALS Contact:** Brent Mack | **Sampler:** Lucas Hennecker

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/Hg (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Chlorophyll a (field filtered 250 mL) (F)	Total Coliform, E. coli, HPC (P)	Dissolved Ferrous Iron (F/P)	Number of Containers
	Halfway River - Downstream (HD)	25-Sept-19	11:45	Water	R	R	R	R	R	R	R					R	R	9
	Middle Site C Reservoir (PR2)		11:15	Water	R	R	R	R	R	R	R					R	R	9
	~~Peace Canyon (PC1)~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~									
	Upper Site C Reservoir (PR1)		9:30	Water	R	R	R	R	R	R	R					R	R	9
	Duplicate 1 (DUP 1)		9:30	Water	R	R	R	R	R	R	R					R	R	9
	~~Field Blank~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~				~~R~~	~~R~~	~~R~~	
	~~Trip Blank~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~		~~R~~						~~R~~		

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from surface water. Please add nich.burnett@bchydro.com and bryan.koehler@bchydro.com to distribution list for results.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☒				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
8			3.5°C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: Sept. 25/19	Time: 19:10	Received by: GEORP	Date: Sept 25/19	Time: 14:10	Received by: JW	Date: Sept. 26/19	Time: 8:15 am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 27-SEP-19
Report Date: 08-OCT-19 17:33 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2355994

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03058-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355994-5				
Description	Water				
Sampled Date	27-SEP-19				
Sampled Time	12:30				
Client ID	FIELD BLANK - SW				
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	<0.010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2355994-1 Water 27-SEP-19 09:45 MOBERLY RIVER - DOWNSTREAM (MD)	L2355994-2 Water 27-SEP-19 09:15 LOWER SITE C RESERVOIR (PR3)	L2355994-3 Water 27-SEP-19 10:55 PEACE AT PINE (PD1)	L2355994-4 Water 27-SEP-19 11:30 PINE RIVER (PINE)	L2355994-5 Water 27-SEP-19 12:30 FIELD BLANK - SW
WATER						
Physical Tests	Colour, True (CU)	22.0	6.4	7.7	8.3	<5.0
	Conductivity (uS/cm)	215	215	207	258	<2.0
	Hardness (as CaCO3) (mg/L)	113	108	108	138	<0.50
	pH (pH)	8.32	8.28	8.29	8.33	6.37
	Total Suspended Solids (mg/L)	14.7	10.9	10.7	22.7	<3.0
	TDS (Calculated) (mg/L)	127	118	120	153	<1.0
	Turbidity (NTU)	10.7	5.33	4.38	12.1	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	115	95.6	99.2	133	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	115	95.6	99.2	133	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.67	<0.50
	Fluoride (F) (mg/L)	0.083	0.053	0.054	0.067	<0.020
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0408	0.0372	0.0263	<0.0051
	Nitrate (as N) (mg/L)	<0.0050	0.0408	0.0372	0.0263	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.257	0.121	0.085	0.123	<0.050
	Total Nitrogen (mg/L)	0.248	0.160	0.172	0.156	<0.030
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0035	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0172	0.0114	0.0123	0.0216	<0.0020
	Silicate (as SiO2) (mg/L)	3.06	4.30	4.08	2.65	<0.50
	Sulfate (SO4) (mg/L)	9.56	18.8	18.6	18.5	<0.30
	Anion Sum (meq/L)	2.50	2.31	2.38	3.06	<0.10
	Cation Sum (meq/L)	2.36	2.16	2.17	2.86	<0.10
	Cation - Anion Balance (%)	-2.8	-3.3	-4.6	-3.4	0.0
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.40	2.86	3.23	2.47	<0.50
	Total Organic Carbon (mg/L)	6.85	2.98	2.96	3.29	<0.50
Bacteriological Tests	E. coli (MPN/100mL)	79	2	2	8	<1
	HPC (CFU/1mL)	32	22 PEHR	43	31	11
	Coliform Bacteria - Total (MPN/100mL)	727	140	127	157	1
Total Metals	Aluminum (Al)-Total (mg/L)	0.274	0.121	0.187	0.434	0.0134 RRV
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050	0.00082	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2355994-6				
	Description	Water				
	Sampled Date	27-SEP-19				
	Sampled Time					
	Client ID	TRIP BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0				
	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (mg/L)	<0.50 HTC				
	pH (pH)	6.05				
	Total Suspended Solids (mg/L)	<3.0				
	TDS (Calculated) (mg/L)	<1.0				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate and Nitrite (as N) (mg/L)	0.0190				
	Nitrate (as N) (mg/L)	0.0141 RRV				
	Nitrite (as N) (mg/L)	0.0049 RRV				
	Total Kjeldahl Nitrogen (mg/L)	<0.050				
	Total Nitrogen (mg/L)	<0.030				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)					
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	<0.30				
	Anion Sum (meq/L)	<0.10				
	Cation Sum (meq/L)	<0.10				
	Cation - Anion Balance (%)	-20.6				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)	<0.50 HTP				
Bacteriological Tests	E. coli (MPN/100mL)					
	HPC (CFU/1mL)					
	Coliform Bacteria - Total (MPN/100mL)					
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0050				
	Antimony (Sb)-Total (mg/L)	<0.00050				
	Arsenic (As)-Total (mg/L)	<0.00050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2355994-1 Water 27-SEP-19 09:45 MOBERLY RIVER - DOWNSTREAM (MD)	L2355994-2 Water 27-SEP-19 09:15 LOWER SITE C RESERVOIR (PR3)	L2355994-3 Water 27-SEP-19 10:55 PEACE AT PINE (PD1)	L2355994-4 Water 27-SEP-19 11:30 PINE RIVER (PINE)	L2355994-5 Water 27-SEP-19 12:30 FIELD BLANK - SW
WATER						
Total Metals	Barium (Ba)-Total (mg/L)	0.155	0.044	0.050	0.097	<0.020
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000288	0.0000318	0.0000395	0.0000303	<0.0000050
	Calcium (Ca)-Total (mg/L)	32.7	31.2	32.1	39.0	<0.10
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	0.0013	<0.0010	<0.0010
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Total (mg/L)	0.0014	<0.0010	0.0022	0.0010	<0.0010
	Iron (Fe)-Total (mg/L)	0.460	0.195	0.262	0.616	<0.030
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.0036	0.0020	0.0021	0.0054	<0.0010
	Magnesium (Mg)-Total (mg/L)	9.42	7.49	8.16	10.7	<0.10
	Manganese (Mn)-Total (mg/L)	0.0179	0.00581	0.00736	0.0143	0.00028 RRV
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.0010	0.0010	0.0011	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	0.0020	0.0011	0.0013	0.0015	<0.0010
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.000177	0.000293	0.000357	0.000409	<0.000050
	Silicon (Si)-Total (mg/L)	2.08	2.17	2.42	2.09	<0.10
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	2.4	<2.0	<2.0	2.3	<2.0
	Strontium (Sr)-Total (mg/L)	0.0826	0.124	0.125	0.134	<0.0050
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.00023	0.00051	0.00053	0.00032	<0.00020
	Vanadium (V)-Total (mg/L)	0.00109	0.00079	0.00108	0.00160	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0050	0.0052	0.0063	0.0188	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Dissolved (mg/L)	0.136	0.040	0.044	0.087	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2355994-6				
	Description	Water				
	Sampled Date	27-SEP-19				
	Sampled Time					
	Client ID	TRIP BLANK				
Grouping	**Analyte**					
WATER						
Total Metals	Barium (Ba)-Total (mg/L)	<0.020				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.20				
	Boron (B)-Total (mg/L)	<0.10				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	<0.10				
	Chromium (Cr)-Total (mg/L)	<0.0010				
	Cobalt (Co)-Total (mg/L)	<0.00030				
	Copper (Cu)-Total (mg/L)	<0.0010				
	Iron (Fe)-Total (mg/L)	<0.030				
	Lead (Pb)-Total (mg/L)	<0.00050				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	<0.10				
	Manganese (Mn)-Total (mg/L)	<0.00010				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	<0.0010				
	Nickel (Ni)-Total (mg/L)	<0.0010				
	Phosphorus (P)-Total (mg/L)	<0.30				
	Potassium (K)-Total (mg/L)	<2.0				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	<0.10				
	Silver (Ag)-Total (mg/L)	<0.000020				
	Sodium (Na)-Total (mg/L)	<2.0				
	Strontium (Sr)-Total (mg/L)	<0.0050				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00050				
	Titanium (Ti)-Total (mg/L)	<0.010				
	Uranium (U)-Total (mg/L)	<0.00020				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0050				
Dissolved Metals	Dissolved Fe2 Filtration Location					
	Dissolved Mercury Filtration Location					
	Dissolved Metals Filtration Location					
	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2355994-1 Water 27-SEP-19 09:45 MOBERLY RIVER - DOWNSTREAM (MD)	L2355994-2 Water 27-SEP-19 09:15 LOWER SITE C RESERVOIR (PR3)	L2355994-3 Water 27-SEP-19 10:55 PEACE AT PINE (PD1)	L2355994-4 Water 27-SEP-19 11:30 PINE RIVER (PINE)	L2355994-5 Water 27-SEP-19 12:30 FIELD BLANK - SW
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.0000059	0.0000077	0.0000076	0.0000099	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	31.3	30.8	30.7	38.5	<0.10
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	0.068	<0.030	<0.030	0.031	<0.030
	Ferrous Iron, Dissolved (mg/L)	0.061	<0.020 SP	<0.020	0.025	<0.020
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0033	0.0018	0.0019	0.0050	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	8.55	7.60	7.72	10.1	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00783	0.00103	0.00122	0.00211	0.00016 RRV
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	0.0011	0.0011	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.000214	0.000415 DTSE	0.000394	0.000445	<0.000050
	Silicon (Si)-Dissolved (mg/L)	1.39	1.94	1.89	1.18	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	2.2	<2.0	<2.0	2.3	<2.0
	Strontium (Sr)-Dissolved (mg/L)	0.0785	0.123	0.121	0.127	<0.0050
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	<0.00020	0.00046	0.00046	0.00027	<0.00020
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2355994-6				
	Description	Water				
	Sampled Date	27-SEP-19				
	Sampled Time					
	Client ID	TRIP BLANK				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)					
	Bismuth (Bi)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Ferrous Iron, Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Phosphorus (P)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silicon (Si)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Strontium (Sr)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					
	Zinc (Zn)-Dissolved (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	B	L2355994-1, -2, -3, -4
Matrix Spike	Total Organic Carbon	MS-B	L2355994-4, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2355994-1, -2, -3, -4, -5
Matrix Spike	Boron (B)-Dissolved	MS-B	L2355994-5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2355994-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2355994-5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2355994-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2355994-5
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2355994-5
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2355994-5
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2355994-5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2355994-1, -2, -3, -4, -5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2355994-5
Matrix Spike	Aluminum (Al)-Total	MS-B	L2355994-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Total	MS-B	L2355994-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2355994-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Total	MS-B	L2355994-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Total	MS-B	L2355994-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L2355994-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
HTP	Sample preparation or preservation hold time was exceeded.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.
RRV	Reported Result Verified By Repeat Analysis
SP	Sample was Preserved at the laboratory

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-VA Water E.coli by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

FE2-D-COL-VA Water Diss. Ferrous Iron in Water by Colour APHA 3500-Fe B/James Ball et al (1999)

This analysis is carried out using procedures adapted from APHA 3500-Fe B and "A New Method for the Direct Determination of Dissolved Iron Concentration in Acid Mine Waters" published by James W. Ball et al (1999). The procedure involves preliminary sample filtration, and ferrous iron is determined using the "FerroZine" colourimetric method.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA Water Total coliform by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

Reference Information

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2355994-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Dist.	Turnaround Time (TAT) is not available for all tests
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	1 (604) 313-9067	Email 1 or Fax Lucas.Hennecker@tetratech.com (see notes)	Specify Date Required for E2,E or P:
		Email 2 Brent.Finnestad@tetratech.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax ebaaccountspayable@tetratech.com	
Company:		Email 2 Lucas.Hennecker@tetratech.com (see notes)	
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03058-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2355994 **ALS Contact:** Brent Mack **Sampler:** Lucas Hennecker

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-Species:Anions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	P TOC, TN, TP, TDP, TKN, NH3	F/P DOC	P Total Metals (CCME+ICP+Hardness) & Hg	F/P Dissolved Metals (CCME+ICP+Hardness)/Hg	F Total Hg (ultra low detection limit)	F Dissolved Hg (ultra low detection limit)	P Total Me-Hg (ultra low detection limit)	F/P Dissolved Me-Hg (ultra low detection limit)	P Total Coliform, E. coli, HPC	F/P Dissolved Ferrous Iron	Number of Containers
	Moberly River - Downstream (MD)	27-Sept-19	9:45	Water	R	R	R	R	R	R	R					R	R	9
	Lower Site C Reservoir (PR3)		9:15	Water	R	R	R	R	R	R	R					R	R	9
	Peace at Pine (PD1)		10:55	Water	R	R	R	R	R	R	R					R	R	9
	Pine River (Pine)		11:30	Water	R	R	R	R	R	R	R					R	R	9
	Field Blank - SW	↓	12:30	Water	R	R	R	R	R	R	R	R				R	R	10
	Trip Blank	—	—	Water	R	R	R	R		R								4

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life and Health Canada Guidelines for Drinking Water. Samples were taken from surface water. Please and nich.burnett@bchydro.com and bryan.koehler@bchydro.com to distribution list for results.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☒				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
9					3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: Sept 27/19	Time: 14:30	Received by: GeoP	Date: Sept 27/19	Time: 14:30	Received by:	Date: 9 128	Time: 8115 PM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Tetra Tech Canada Inc.
ATTN: Lucas Hennecker
1000-885 Dunsmuir Street, 10th Floor
Vancouver BC V6E 1N5

Date Received: 26-SEP-19
Report Date: 09-OCT-19 14:33 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2355246

Project P.O. #: NOT SUBMITTED
Job Reference: VENW03060-03.002
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2355246-1	L2355246-2	L2355246-3	L2355246-4	L2355246-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19
	Sampled Time	09:05	09:35	10:10	10:35	11:15
	Client ID	PEACE AT BEATTON (PD2)	BEATTON RIVER (BEA)	PEACE AT KISKATINAW (PD3)	KISKATINAW RIVER (KR)	PEACE AT POUCE COUPE (PD4)
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	8.8	266	51.3	34.5	35.3
	Conductivity (uS/cm)	250	143	218	342	224
	pH (pH)	8.30	7.61	8.22	8.43	8.09
	Total Suspended Solids (mg/L)	11.4	66.6	19.2	51.2	17.4
	Total Dissolved Solids (mg/L)	154	165	137	245	157
	Turbidity (NTU)	4.90	63.7	14.6	66.0	12.0
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	112	36.6	104	201	112
	Alkalinity, Carbonate (as CaCO3) (mg/L)	4.6	<1.0	<1.0	7.4	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	117	36.6	104	208	112
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0254	0.0062	0.0125	0.0063
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	0.64	<0.50	0.80	<0.50
	Fluoride (F) (mg/L)	0.053	0.070	0.057	0.084	0.063
	Nitrate and Nitrite (as N) (mg/L)	0.0288	<0.0051	0.0332	0.0156	0.0330
	Nitrate (as N) (mg/L)	0.0288	<0.0050	0.0332	0.0156	0.0330
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.102	0.924	0.223	0.464	0.174
	Total Nitrogen (mg/L)	0.140	0.867	0.265	0.444	0.219
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	0.0073	0.0023	<0.0010	0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	0.0308	0.0053	0.0048	0.0076
	Phosphorus (P)-Total (mg/L)	0.0124	0.0955	0.0328	0.0705	0.0222
	Silicate (as SiO2) (mg/L)	3.53	6.93	4.68	5.27	4.46
	Sulfate (SO4) (mg/L)	19.8	29.0	21.7	10.3	21.8
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.04	39.6	9.30	11.7	6.87
	Total Organic Carbon (mg/L)	3.13	44.6	9.89	13.5	7.26

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2355246-6	L2355246-7			
	Description	Water	Water			
	Sampled Date	26-SEP-19	26-SEP-19			
	Sampled Time	14:15	12:35			
	Client ID	POUCE COUPE (POUCE)	PEACE AT MANY ISLANDS (PD5)			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	47.1	30.6			
	Conductivity (uS/cm)	510	223			
	pH (pH)	8.33	8.07			
	Total Suspended Solids (mg/L)	8.0	14.8			
	Total Dissolved Solids (mg/L)	348	164			
	Turbidity (NTU)	12.8	12.7			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	171	109			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	5.2	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	177	109			
	Ammonia, Total (as N) (mg/L)	0.0132	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	7.10	0.51			
	Fluoride (F) (mg/L)	0.157	0.062			
	Nitrate and Nitrite (as N) (mg/L)	0.0093	0.0306			
	Nitrate (as N) (mg/L)	0.0093	0.0306			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.706	0.212			
	Total Nitrogen (mg/L)	0.732	0.229			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0078	0.0031			
	Phosphorus (P)-Total (mg/L)	0.0319	0.0221			
	Silicate (as SiO2) (mg/L)	<0.50	4.06			
	Sulfate (SO4) (mg/L)	105	20.9			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	18.8	6.29			
	Total Organic Carbon (mg/L)	19.8	6.90			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Alkalinity, Total (as CaCO3)	B	L2355246-4, -5, -6, -7
Matrix Spike	Dissolved Organic Carbon	MS-B	L2355246-2
Matrix Spike	Total Organic Carbon	MS-B	L2355246-1, -3, -4, -5, -6, -7
Matrix Spike	Total Organic Carbon	MS-B	L2355246-2
Matrix Spike	Total Nitrogen	MS-B	L2355246-1, -2, -3, -4, -5, -6
Matrix Spike	Phosphorus (P)-Total	MS-B	L2355246-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sulfate (SO4)	MS-B	L2355246-6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-PRES-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2355246-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech Canada Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Lucas Hennecker	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5	☑ Criteria on Report - provide details below if box checked Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	1 (604) 313-9067	Email 1 or Fax Lucas.Hennecker@tetratech.com (see notes) Email 2 Brent.Finnestad@tetratech.com	Specify Date Required for E2,E or P:

Invoice To		Invoice Distribution
Same as Report To	☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Copy of Invoice with Report	☑ Yes ☐ No	Email 1 or Fax ebaaccountspayable@tetratech.com
Company:		Email 2 Lucas.Hennecker@tetratech.com (see notes)
Contact:		

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENW03060-03.002	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L2355246.

ALS Contact: Brent Mack

Sampler: Lucas Hennecker

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CCME+ICP+Hardness) & Hg (P)	Dissolved Metals (CCME+ICP+Hardness)/H (F/P)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit) (F)	Total MeHg (ultra low detection limit) (P)	Dissolved MeHg (ultra low detection limit) (F/P)			Number of Containers
	Peace at Beatton (PD2)	26-Sept-19	9:05	Water	R	R	R	R	R									3
	Beatton River (BEA)	↓	9:35	Water	R	R	R	R	R									3
	Peace at Kiskatinaw (PD3)	↓	10:10	Water	R	R	R	R	R									3
	Kiskatinaw River (KR)	↓	10:35	Water	R	R	R	R	R									3
	Peace at Pouce Coupe (PD4)	↓	11:15	Water	R	R	R	R	R									3
	Pouce Coupe (POUCE)	↓	14:15	Water	R	R	R	R	R									3
	Peace at Many Islands (PD5)	↓	12:35	Water	R	R	R	R	R									3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

Please use criteria: BC MOE 2018 Approved and Working Water Quality Guidelines for freshwater aquatic life. Samples were taken from surface water. Please add nich.burnett@bchydro.com to distribution list for results

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☒

Ice packs Yes ☒ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C: 6°C

FINAL COOLER TEMPERATURES °C: 3°C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lucas Hennecker	Date: Sept. 26/19	Time: 16:20	Received by: Shylin	Date: Sep 26/19	Time: 4:20	Received by: DJ	Date: Sep 27/19	Time: 6:15am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**